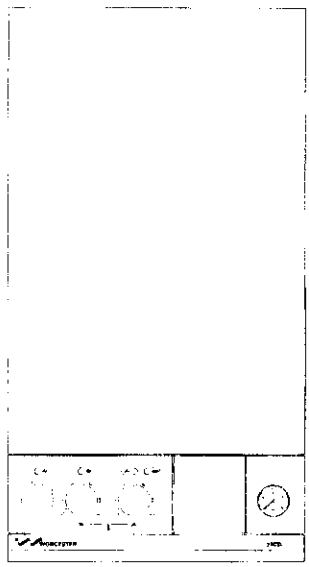
WORCESTER

Bosch Group

28CDi RSF

WALL MOUNTED COMBINATION BOILER FOR CENTRAL HEATING AND MAINS FED DOMESTIC HOT WATER

INSTALLATION AND SERVICING INSTRUCTIONS



GC NUMBER 47 311 34 (N.G.)

GC NUMBER 47 311 35 (L.P.G.)

benchmark

Worcester Bosch supports the Benchmark code of practice

BOILER OUTPUT

Automatic Modulating Control

	To Domestic Hot Water	To Central Heating
Minimum	9.0 kW	9.0 kW
Maximum	28.0 kW	24.0 kW

IMPORTANT: THESE INSTRUCTIONS APPLY IN THE UK ONLY

THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE GAS METER

This appliance must be installed by a competent person in accordance with the Gas Safety (Installation and Use) Regulations 1994

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1. Installation Regulations

1.1 Gas Safety (Installation and Use) Regulations, October 1994 all gas appliances must be installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

1.2 The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

1.3 The compliance with a British Standard does not, of itself, confer immunity from legal obligations. In particular the installation of this appliance must be in accordance with the relevant requirements of the Gas Safety (Installation and Use) Regulations 1984 as amended, current IEE Wiring Regulations BS 7671, local Building Regulations, Building Standards (Scotland)(Consolidation) and bylaws of the local Water Company. Health and Safety Document No. 635 (Electricity at Work Regulations).

It should be in accordance with the relevant recommendations of the following British Standards.

BS 6798:1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60 kW.

BS 5449:1990 Central Heating for Domestic Premises.

BS 5546:1990 Installation of gas hot water supplies for domestic purposes.

BS 5440:1:1990 Flues and Ventilation for gas appliances of rated input not exceeding 60 kW: Flues.

BS 5440:2:1989 Flues and Ventilation for gas appliances of rated input not exceeding 60kW: Air Supply.

BS 6891:1988 Installation of low pressure gas pipework installations up to 28mm (R1).

1.4 To ensure that the installation will perform to the highest standards, the system and components should conform to any other relevant British Standards in addition to those mentioned in the instructions.

1.5 The advice and instructions given in this document covers, as far as possible, the foreseeable situations which may arise. Contact Worcester Heat Systems for advice on specific installations.

2. General Information

2.1 This appliance is not suitable for external installation.

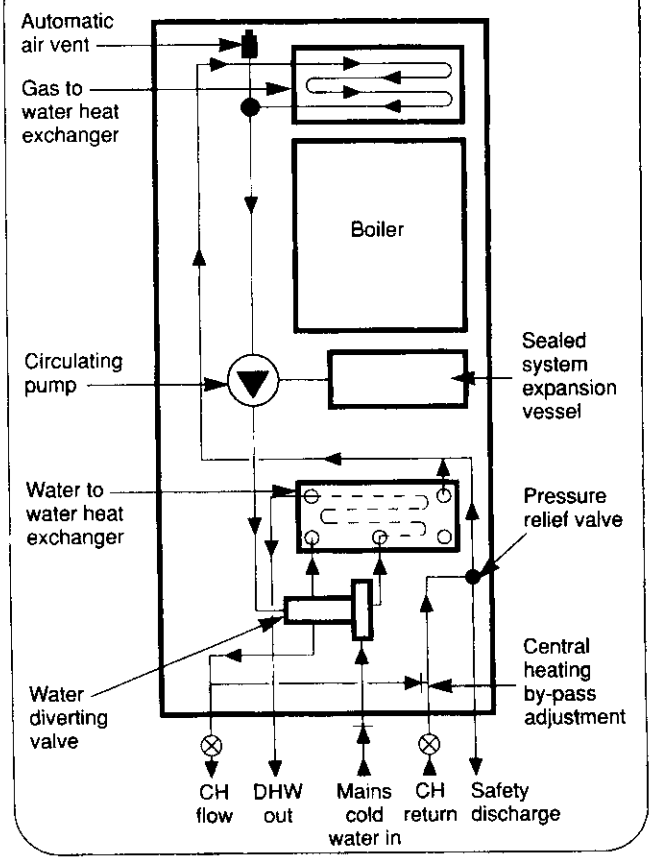
2.2 The appliance controls are set to provide a maximum output of 28 kW for the domestic hot water and 24 kW for central heating load.

2.3 The control circuit provides direct burner ignition. A pilot is not used.

2.4 PRINCIPAL APPLIANCE COMPONENTS. See Fig. 1.

A low thermal capacity Gas to Water heat exchanger.
A Water to Water heat exchanger to provide domestic hot water.
Fully modulating controls in the central heating and domestic hot water modes of operation.
An expansion vessel, pressure gauge and pressure relief valve.
A by-pass for the central heating system.
Temperature safety cut-out controls.
A water flow regulator.
A standard horizontal flue assembly giving flue lengths from 100mm to 650mm.
An internal system filling link assembly.
An optional extra extension flue kits to provide for flue lengths up to 3000mm.
Optional 45° and 90° Flue Bends.
Optional facia mounted electronic or mechanical programmers and a radio controlled thermostat.
An optional open vent feed pipe assembly.

Fig. 1. Appliance water flow diagram.



2.5 ELECTRICAL SUPPLY

Mains supply: 230V ~, 50 Hz.
External fuse: 3A., Internal fuses: T 2A (F1), and T 1.25A (F2).

2.6 GAS SUPPLY

Check the data plate (located on the inner cover of the appliance) to ensure the appliance has been set up for the correct gas supply. The appliance can be set up for either of the following gases: Natural gas (G20) or propane (G31). **A conversion kit, including instructions, is available to change the appliance from one gas to the other.**

The boiler requires 3.35 m^3/h (115 ft^3/hr) of natural (G20) or 1.29 m^3/hr (46 ft^3/hr or propane gas (G31). The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demands of any other appliances being served. The meter governor should deliver a dynamic pressure of 20 mbar (8in wg.) for natural gas or 37 mbar (14.4 in wg.) for propane.

The complete installation, including the gas meter, must be tested for soundness and purged. Refer to BS 6891.

2.7 PACKING

The appliance and flue components are packed in separate cartons.

2.8 GENERAL INSTALLATION

The appliance is for connection to a sealed or open vented primary system.

The specified ventilation openings made into a wall or compartment door must not be obstructed.

If the appliance is to be fitted into a compartment then the compartment must conform to the requirements of BS 5440:2:1989.

Notwithstanding the instructions given in BS 5440:2:1989, this appliance may be fitted in a compartment with no vents as long as the minimum clearances stated in Section 6: Air Supply, are maintained.

Do not place anything on top of the appliance.

The clearances specified for servicing must be maintained.

2.9 FLUE

The appliance has a multi-directional horizontal fanned flue system.

The standard flue assembly length is from 100mm to 650mm.

Extension flue lengths available are from 651mm to 3000mm.

A terminal guard, Type K2, GC 393 553, is available from Tower Flue Components, Vale Rise, Tonbridge,TN9 1TB.

Do not allow the flue terminal fitted to the outside wall to become obstructed or damaged.

A kit for internal fixing of the flue is available separately.

2.10 CONTROLS

The electronic control system and gas valve modulate the heat input in response to the central heating and domestic hot water temperature settings between minimum and maximum.

The ON/OFF switch will turn the mains electricity on and off to the appliance.

The Central Heating Temperature control knob provides for the selection of domestic hot water only (Turned fully anti-clockwise) or central heating and domestic hot water (Turned clockwise).

Facia mounted programmers are available as an optional extra. A remote mounted programmer may be connected to the appliance.

The integral facia displays indicate the status of the appliance.

There is provision for the connection of a mains voltage room thermostat and/or a frost thermostat.

The electronic controls prevent rapid cycling of the appliance in the central heating mode.

2.11 SYSTEM NOTES

IMPORTANT

Check that no dirt is left in either the gas or water pipework as this could cause damage to the appliance. Thoroughly flush the heating system and the cold water mains supply in accordance with the recommendations of BS7593: 1992

Purge the gas supply before finally connecting the appliance.

The water pipe connections throughout a sealed system must be capable of sustaining a pressure of up to 3 bar.

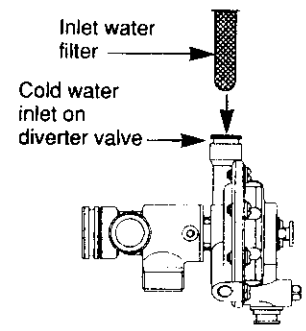
Radiator valves must conform to the requirements of BS 2767 1991.

The relief valve discharge must be directed away from any electrical components or where it would cause a hazard to the user.

A drain cock to BS 2879 must be fitted to the lowest point of the system.

Fig. 1a.

IMPORTANT:
After flushing out all pipework and before mounting the appliance please ensure that the water inlet filter contained in the fixing kit is fitted as shown.



For circuit design purposes it is important that due note is taken of the information given in Table 3 relating to the available pump head.

2.12 SHOWERS, BIDETS, TAPS AND MIXING VALVES

Hot and cold taps and mixing valves used in the system must be suitable for operating at mains pressure.

Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

If using a pressure equalising valve, set the Domestic Hot Water temperature control knob to the 'MAX' position.

Hot and cold mains fed water can be supplied direct to an over-rim flushing bidet subject to local Water Company requirements.

With all mains fed systems the flow of water from the individual taps will vary with the number of outlets operated simultaneously and the cold water mains supply pressure to the property. Flow balancing using 'Ball-o-Fix' type valves is recommended to avoid an excessive reduction in flow to individual outlets. For further information contact Worcester Heat Systems Ltd.

2.13 SAFETY CONSIDERATIONS

The appliance must not be operated in a waterless condition.

The appliance must not be operated with the boiler inner casing cover removed.

Work must not be carried out on the appliance without the gas and electricity supplies being switched off.

Checks must be made to ensure that the ventilation openings made into walls and partitions are of the correct size and are not obstructed.

2.14 OPERATION

Domestic Hot Water: With a demand for hot water the burner will light at its maximum setting and then automatically adjust its output to maintain the temperature of the delivered water. When hot water is no longer required, the burner will extinguish. The fan and pump may continue to run for a short period to dissipate the residual heat from the appliance.

Central Heating: With a demand for heating the burner will light at its minimum setting and gradually increase to give the maximum output. The output of the appliance is then automatically adjusted to maintain the temperature of the system. The output can reduce down to a minimum of 9.0 kW. If the system no longer requires even the minimum output to maintain the desired room temperature the burner will extinguish. The fan and pump may continue to run to dissipate the residual heat from the appliance. The appliance will remain off for a fixed period of three minutes before re-lighting to automatically meet the system requirements.

Domestic Hot Water and Central Heating: The appliance will supply heat to the central heating system as required. A demand for domestic hot water at a tap or shower will override the central heating requirement for the period of the domestic hot water demand. When hot water is no longer required the appliance will return to the central heating state and its normal mode of operation. The fan may continue to run to dissipate the residual heat from the appliance as necessary.

3. Technical Data

The data plate is fixed to the inner casing cover. Check data plate to ensure appliance has been adjusted for supply gas.

Table 1

NOMINAL BOILER RATINGS (10 Minutes After Lighting)							
BOILER ADJUSTED FOR G20 (Natural Gas)							
OUTPUT		INPUT		BURNER SETTING PRESSURE		GAS RATE	
kW	Btu/h	kW	Btu/h	m bar.	in. wg.	m^3/h	ft^3/h
9.0	(30,700)	11.4	(38,897)	1	0.4	1.2	42.5
24.0	(81,888)	27.0	(92,124)	8.8	3.5	2.9	102.7
28.0	(95,536)	31.5	(107,478)	12.1	4.8	3.3	116.9
BOILER ADJUSTED FOR G31 (Propane)							
9.0	(30,708)	11.4	(38,897)	3.8	1.5	0.5	17.7
24.0	(81,888)	27.0	(92,124)	24.3	9.6	1.1	38.9
28.0	(95,536)	31.5	(107,478)	35.5	14	1.3	46.0

Table 2.

FLUE DETAILS		
HORIZONTAL FLUE	**mm**	**inches**
WALL HOLE DIAMETER	110	4.25
STANDARD FLUE – MINIMUM LENGTH	100	4.0
STANDARD FLUE – MAXIMUM LENGTH	650	25.6
EXTENDED FLUE – MAXIMUM LENGTH	3000	118.1

Table 3

AVAILABLE PUMP HEAD						
BOILER OUTPUT		HEAD		MIN. FLOW RATE		TEMPERATURE RISE ACROSS HEATING FLOW AND RETURN
kW	Btu/h	Metres	Feet	L/min.	Gal/Min.	
9.0	(30,700)	4.2	13.6	11.7	2.57	11°C (20°F)
24.0	(81,900)	2.0	6.6	28.5	6.3	12°C (22°F)

Table 4

SPECIFICATIONS	
CENTRAL HEATING FLOW FITTING	22mm Compression
CENTRAL HEATING RETURN FITTING	22mm Compression
COLD WATER MAINS INLET FITTING	15mm Compression
DOMESTIC HOT WATER OUTLET FITTING	15mm Compression
GAS INLET FITTING	Rp ¾ inch
PRESSURE RELIEF VALVE DISCHARGE FITTING	G ½ inch
OVERALL HEIGHT (including flue turret)	1000mm (39.4 inches)
CASING HEIGHT	850mm (33.5 inches)
CASING WIDTH	450mm (17.7 inches)
CASING DEPTH	360mm (14.2 inches)
WEIGHT(including water)	45 kg
INSTALLATION WEIGHT	42 kg
PACKAGED WEIGHT	48 kg
PRIMARY WATER CAPACITY	2.0 litres (0.45 galls)
MAXIMUM COLD SUPPLY PRESSURE	10 Bar (150 psi)
MINIMUM COLD SUPPLY PRESSURE (working) for max. hot water flow	1.2 bar
MINIMUM COLD SUPPLY PRESSURE (working) to operate appliance	0.7 bar
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	Nominally 82°C (180°F)
OUTPUT TO DOMESTIC HOT WATER	Modulating 9.0 to 28 kW
OUTPUT TO CENTRAL HEATING	Modulating 9.0 to 24 kW
MAXIMUM DOMESTIC HOT WATER FLOW RATE (from the appliance)	Nominally 10 litres/min
EQUIVALENT DOMESTIC HOT WATER FLOW RATE TO GIVE A TEMP RISE OF 30°C (SPECIFIC RATE)	Nominally 13.5 litres/min
NoX Classification	Class 3

4. Siting The Appliance

4.1 The appliance may be installed in any room although particular attention is drawn to the requirements of the current I.E.E. Wiring Regulations BS 7671 and, in Scotland, the electrical provisions of the Building Regulations applicable in Scotland, with respect to the installation of appliances in rooms containing baths or showers.

Where a room sealed appliance is installed in a room containing a bath or shower, any electrical switch or appliance control using mains electricity must not be able to be touched by a person using the bath or shower.

4.2 The appliance is not suitable for external installation.

4.3 The appliance does not require any special wall protection.

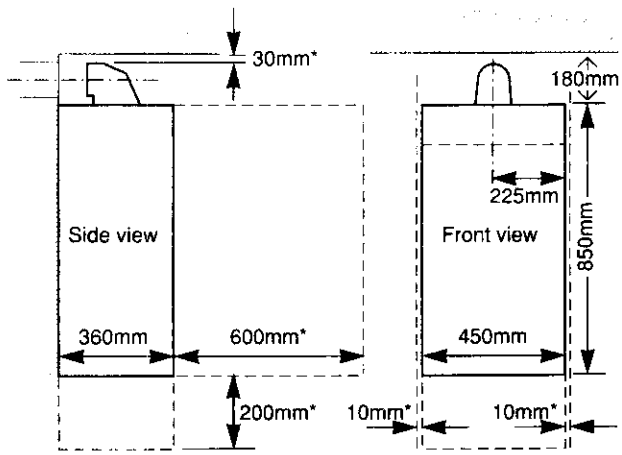
4.4 The wall must be capable of supporting the weight of the appliance. See Table 4.

4.5 The following clearances must be available for installation and for servicing. See Fig. 2.

4.6 The appliance can be installed in a cupboard used for airing clothes provided that the requirements of BS 6798 and BS 5440:2 are met.

	Installation	Service
Above the flue turret	30mm	30 mm
In front	600 mm	600 mm
Below	200mm	200mm
Right-hand side	10 mm	10 mm
Left-hand side	10 mm	10 mm

Fig. 2. Appliance casing dimensions and required clearances.



* Space required for installation and servicing

Notwithstanding the instructions given in BS 5440:2, this appliance may be fitted in a compartment with no vents as long as the minimum clearances stated in Section 6: Air Supply, are maintained.

4.7 The airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh are acceptable provided that the major dimension is less than 13mm. See BS 6798:1987.

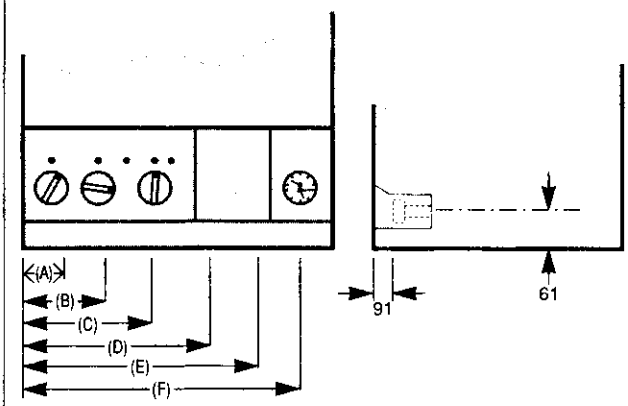
4.8 No combustible surface must be within 75mm of the casing. See BS476:4.

4.9 The distance between the inner face of a cupboard door and the cabinet front should not be less than 75mm.

4.10 Always consider the possible need to disconnect the pipes from the appliance after installation.

4.11 LPG Installation: The appliance shall not be installed in a room or internal space below ground level when it is intended for use with LPG. This does not preclude the installation into rooms which are basements with respect to one side of the building but open to ground level on the opposite side.

Fig. 3. Appliance pipework connections.



A	CH Flow	= 62.5
B	DHW Out	= 127.5
C	Mains Cold Water In	= 192.5
D	Gas Inlet	= 257.5
E	CH Return	= 322.5
F	Safety Relief	= 382.5

5. Siting The Flue Terminal

See Fig. 4

5.1 The flue must be installed as specified in BS 5440:Part 1.

5.2 The terminal must not cause an obstruction nor the discharge cause a nuisance.

5.3 If the terminal is fitted within 1000mm of a plastic or painted gutter or within 500mm of painted eaves then an aluminium shield at least 1000mm long should be fitted to the underside of the gutter or painted surface.

5.4 If a terminal is fitted less than 2 metres above a surface to which people have access then a guard must be fitted. See Section 2.9.

5.5 The terminal guard must be evenly spaced about the flue terminal and fixed to the wall using plated screws.

5.6 In certain weather conditions a terminal may steam and siting where this could cause a nuisance should be avoided.

5.7 Take care to ensure that combustion products do not enter ventilated roof voids.

6. Air Supply

6.1 The appliance does not require a separate vent for combustion air.

6.2 The appliance can be fitted in a cupboard with no vents for cooling but the minimum clearances must be increased to those given below. (**Note:** The clearances at the front are for a removable panel, e.g. a door).

Above the flue turret	30mm
In front	250mm
Below	200mm
Right-hand side	75mm
Left-hand side	75mm

6.3 If the appliance is to be fitted in a cupboard or compartment with less clearance than those in the table above (minimum clearances are given in Section 4. Siting The Appliance) then permanent air vents for cooling are required. One at high level and one at low level, either direct to outside air or to a room. Both vents must pass to the same room or be on the same wall to the outside air.

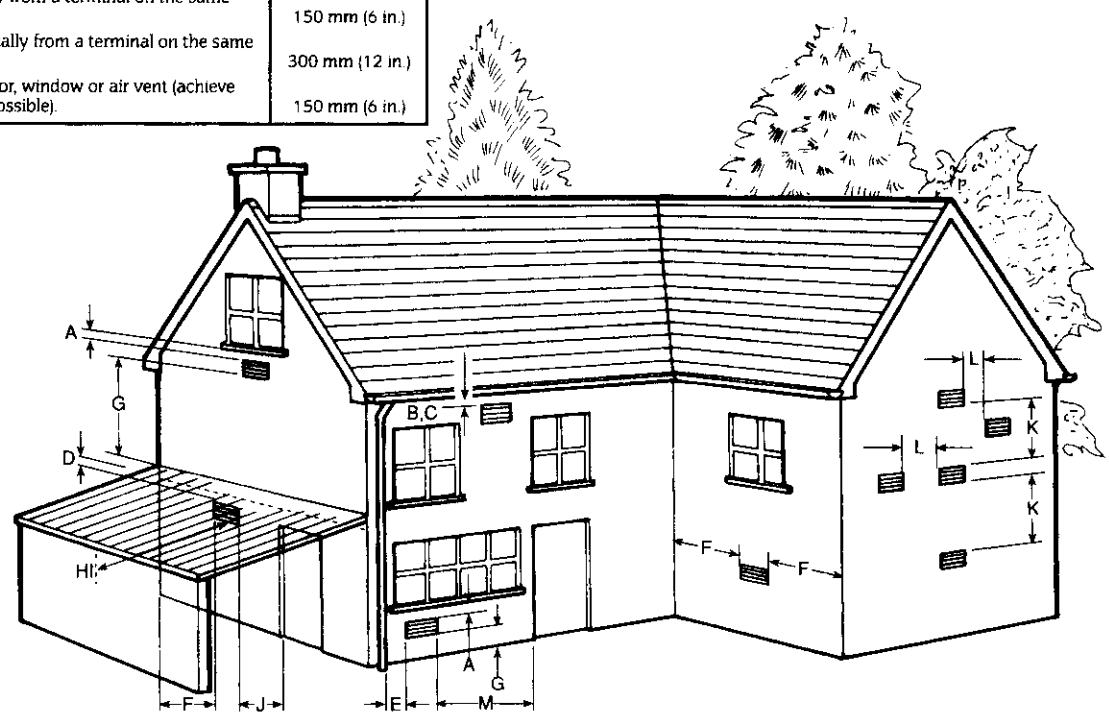
6.4 The minimum free areas required are given below.

POSITION OF AIR VENTS	AIR FROM THE ROOM	AIR DIRECT FROM OUTSIDE
HIGH LEVEL	315 cm^2	158 cm^2
LOW LEVEL	315 cm^2	158 cm^2

6.5 Refer to BS 6798 and BS 5440:2 for additional information.

Fig. 4. Siting of the flue terminal.

TERMINAL POSITION	MIN. DISTANCE
A– directly below an openable window or other opening e.g. air brick.	300 mm (12 in.)
B– Below gutters, soil pipes or drain pipes.	75 mm (3 in.)
C– Below eaves.	25 mm (1 in.)
D– Below balconies or car port roof.	25 mm (1 in.)
E– From vertical drain pipes and soil pipes.	25 mm (1 in.)
F– From internal or external corners.	25 mm (1 in.)
G– Above ground, roof or balcony level.	300 mm (12 in.)
H– From a surface facing a terminal.	600 mm (24 in.)
I– From a terminal facing a terminal	1200 mm (47 in.)
J– From an opening in a car port (e.g. door window) into dwelling.	1200 mm (47 in.)
K– Vertically from a terminal on the same wall.	150 mm (6 in.)
L– Horizontally from a terminal on the same wall.	300 mm (12 in.)
M– From door, window or air vent (achieve where possible).	150 mm (6 in.)



7. Sealed Primary Systems

See Figs. 5, 6 and 6a.

7.1 The system must comply with the requirements of BS 6798 and BS 5449.

7.2 The appliance must not be operated without the system being full of water, properly vented and pressurised.

7.3 The pressure relief valve operates at 3 bar (45lb/in²). The discharge must be directed away from electrical components or where it might be a hazard to the user.

7.4 The pressure gauge indicates the system pressure which must be maintained.

7.5 The 10 litre expansion vessel is charged to 0.5 bar and is suitable for a static head of 5 metres (17.5ft). The pressure can be increased if the static head is greater than 5 metres (17.5ft).

7.6 With an initial system pressure of 0.5 bar, a system capacity of about 83 litres can be accommodated. Refer to BS 7074 Pt. 1 for more information. The charge pressure can be increased but with a decrease in system volume.

7.7 The appliance includes a system filling link.

7.8 Water loss must be replaced.

7.9 Filling the System. (See Fig. 6 and 6a). Remove the bottom panel to gain access to the filling loop assembly. (The grey knob for the filling loop is packed in the hardware pack and should be fitted as shown).

Insert the bayonet end of the filling key into the corresponding cut outs in the filling loop housing and twist to lock the key in place.

Turn the grey knob anti-clockwise to allow water ingress and fill until the required pressure is reached.

Turn the grey knob clockwise to stop filling and remove the filling key by lining up the bayonet end of the key with the cutouts in the filling loop housing and withdrawing the key.

N.B. The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with Byelaw 14 of the Water Byelaws Scheme.

Store the key in a safe place for future use and refit the bottom panel.

7.10 Repeated venting loses water from the system. It is essential that this water is replaced and the system pressure maintained.

7.11 Connections to the mains water supply must not be made without the authority of the local Water Company.

7.12 The pump is set at maximum and must not be adjusted.

7.13 Connections in the system must resist a pressure of up to 3 bar.

7.14 Radiator valves must conform to BS 2767:10.

7.15 Other valves used should conform to the requirements of BS 1010.

Fig. 5. Sealed primary water system.

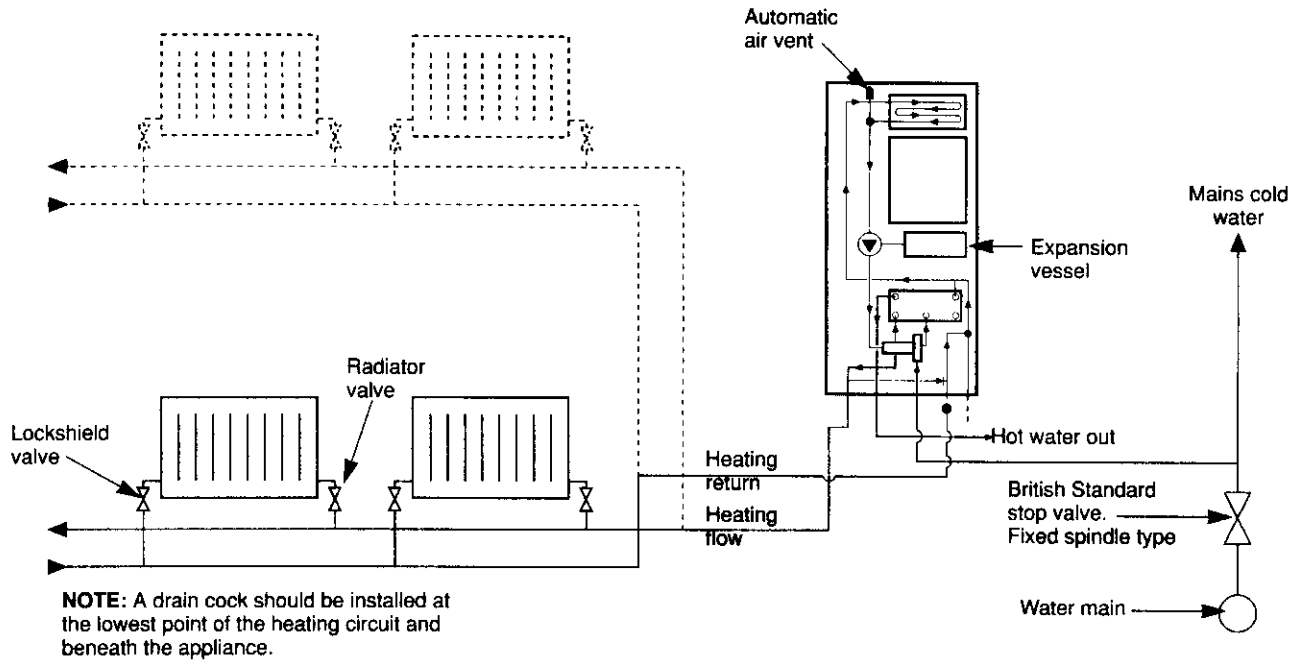

Automatic air vent
Mains cold water
Expansion vessel
Radiator valve
Lockshield valve
Hot water out
Heating return
Heating flow
British Standard stop valve. Fixed spindle type
Water main
NOTE: A drain cock should be installed at the lowest point of the heating circuit and beneath the appliance.

Fig. 6. Filling Loop.

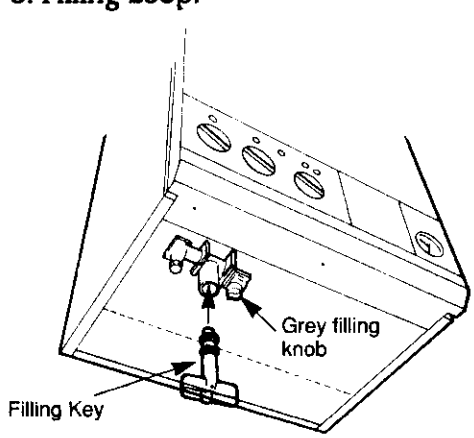
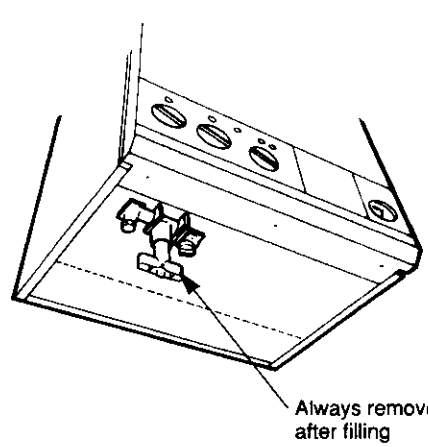


Fig. 6a. Filling Key inserted for filling.



8. Open Vent Primary Systems

8.1 The size of the flow and return pipework is given in Section 3 – Table 4. The components required to connect the appliance to an open vent system are available as an optional extra kit.

8.2 The feed and expansion cistern should be arranged so that there is a minimum static head of 0.3 metres (12 inches) above the top of the appliance or above the highest point in the heating circuit, whichever is the higher. See fig. 7

8.3 The feed and vent pipe should be 22mm diameter and rise continuously from the appliance to the feed and expansion cistern.

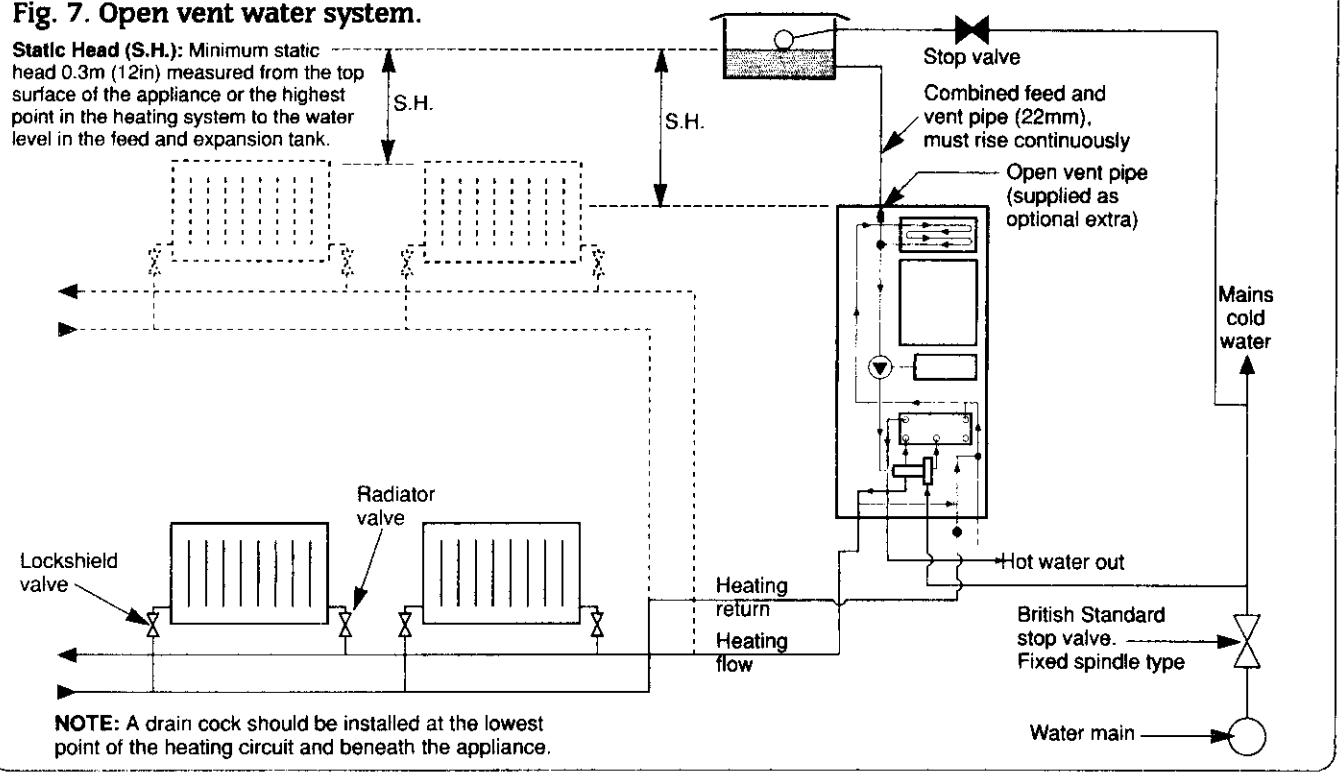
8.4 A pressure relief valve is not required on an open vented system.

8.5 Air within the appliance will be expelled via the feed and vent connection or dissipated into the rest of the system which must be fitted with manual air vents at any high point.

8.6 The pump is set to maximum and must not be reset.

8.7 If it is required to use the appliance for domestic hot water before the central heating circuit is connected, a 22mm copper by-pass must be connected between the central heating flow and return. Refer to Section 12.

Fig. 7. Open vent water system.


Static Head (S.H.): Minimum static head 0.3m (12in) measured from the top surface of the appliance or the highest point in the heating system to the water level in the feed and expansion tank.
S.H.
S.H.
Stop valve
Combined feed and vent pipe (22mm), must rise continuously
Open vent pipe (supplied as optional extra)
Mains cold water
Radiator valve
Lockshield valve
Hot water out
Heating return
Heating flow
British Standard stop valve. Fixed spindle type
Water main
NOTE: A drain cock should be installed at the lowest point of the heating circuit and beneath the appliance.

9. Domestic Hot Water

9.1 The following are general requirements and, if necessary, reference should be made to the local Water Company before fitting the appliance.

9.2 MAINS COLD WATER INLET. Devices capable of preventing the flow of expansion water must not be fitted unless separate arrangements have been made. An expansion vessel connection point is provided within the appliance.

An Rc1/2" connection is provided. A Zilmet Z160 is the preferred type. A thread sealant compatible with potable water must be used.

9.3 The final 600mm of the mains cold water connection to the appliance should be made in copper tube only.

9.4 The appliance is suitable for a mains pressure of up to 10 bar (150 lb/in^2).

9.5 The appliance is fitted with a mains supply isolating valve.

9.6 The maximum domestic hot water flow rate is 10 litres/min (±15%) (2.2 gallons/min).

9.7 In winter (when the mains inlet water temperature is lower) a reduced flow rate at the taps may be required to achieve the type of hot water delivery temperature available in warmer weather.

9.8 It is suggested that long pipe runs to the taps or shower should be insulated to prevent the rapid cooling of domestic hot water after a tap or shower has been turned off.

9.9 Hot and cold taps and mixing valves used with this appliance must be suitable for operating at mains pressure and temperatures of 65°C.

9.10 No anti-syphonage arrangements are necessary except for some loose head showers. See also Section 9.11 following.

9.11 Thermostatically controlled or pressure equalising shower valves will guard against the flow of water at too high a temperature.

9.12 The head of a loose head shower must not fall closer than 25mm (1in) above the top edge of the bath to prevent its immersion in bath water. Alternatively the shower must be fitted with an anti-syphonage device at the point of the flexible hose connections.

9.13 The supply of hot and cold mains water direct to a bidet is permitted, (subject to local Water Company requirements), provided that the bidet is of the over-rim flushing type. The outlet(s) should be shrouded and unable to have any temporary hand held spray attached. No anti-syphonage arrangements are necessary.

9.14 As the maximum temperature of the Water to Water heat exchanger is limited by the control circuit, there is normally no need for water treatment to prevent scale accumulation. In exceptional circumstances a device to prevent scale formation can be fitted.

Installation of a scale inhibitor assembly should be in accordance with the requirements of the local Water Company. An isolating valve should be fitted to allow servicing. The water hardness can be determined using a standard test paper or by reference to the local Water Company.

10. Electrical

See Figs. 8, 9, 10, 11, 12 and 13.

10.1 MAINS SUPPLY.

230 V ~, 50 Hz, 180 watts.

External Fuse: 3A. Internal Fuses: T 2A (F1), and T 1.25A (F2).

Spare internal fuses are supplied at the rear of the facia, next to the pressure gauge.

10.2 It must be possible to completely isolate the appliance.

10.3 The following connection alternatives must be used:

A 3 amp fused three-pin plug and unswitched shuttered socket outlet (both complying with the requirements of BS 1363) or a double pole isolator with a contact separation of 3mm in all poles and supplying the appliance and controls only.

10.4 The appliance must be earthed.

10.5 Mains Cable. 0.75mm² (24 x 0.20mm) to BS 6500 Table 16. The mains cable must be connected into the terminal **ST12**, marked L (Brown or Red lead), **N** (Blue or Black lead) and the earth stud and be held securely in the cable clamp. For access undo the three bottom screws and remove the facia access cover. See Fig. 23.

10.6 The wiring between the appliance and the electrical supply shall comply with current IEE Wiring Regulations and any local regulations which apply.

10.7 If a room thermostat and/or external programmer is to be fitted refer to Figs 11, 12 and 13. The devices must be suitable for use with mains voltage.

10.8 Facia mounted programmers are available as optional extras. Instructions are supplied with the programmer kits.

10.9 A time switch or programmer can be fitted externally to the appliance.

10.10 The boiler is fitted with an internal frost thermostat which will protect the boiler from frost damage, as long as the mains switch on the boiler is in the on position. However, if frost protection is necessary for the system, please contact Worcester Heat Systems Technical Helpline. Tel: 0990 266241.

10.11 SAFETY CHECK.

After installation or in the event of an electrical fault the electrical system shall be checked for short circuits, fuse failure, incorrect polarity of connections, earth continuity and resistance to earth.

Fig. 8. Mains electricity connections.

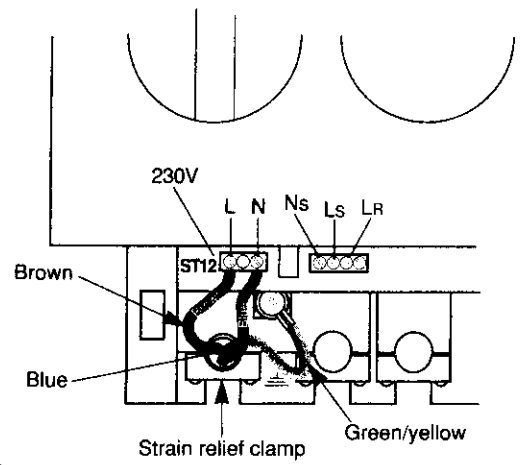


Fig. 9. Wiring diagram.

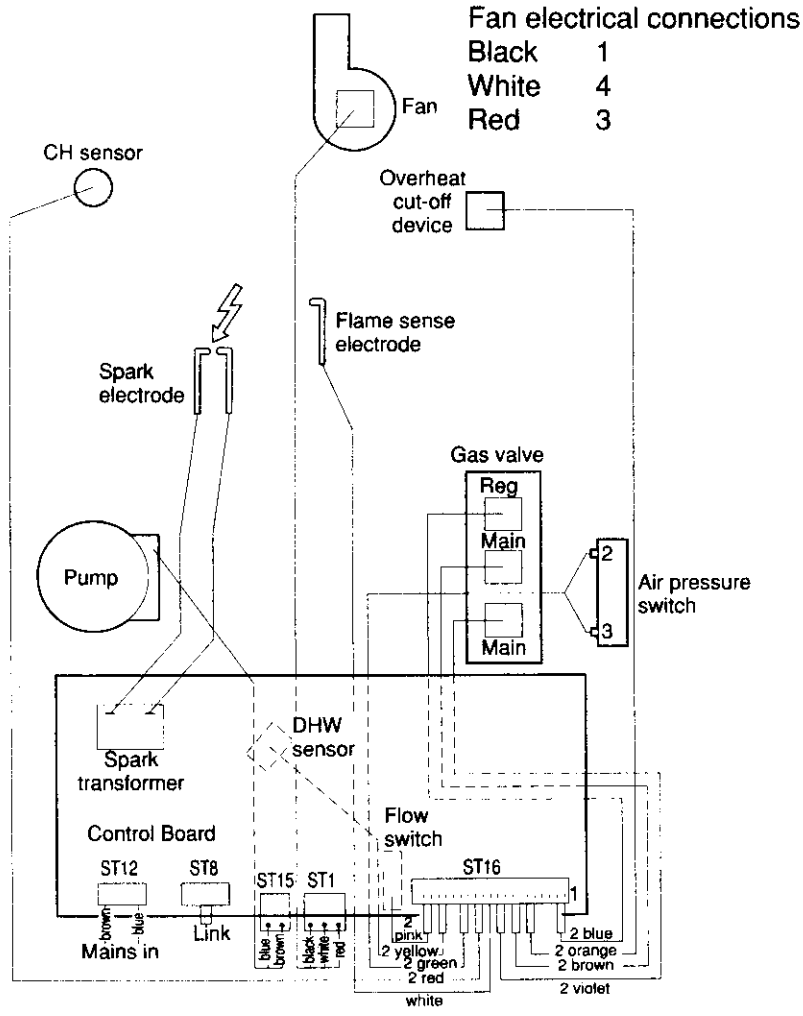


Fig. 10. Functional flow diagram.

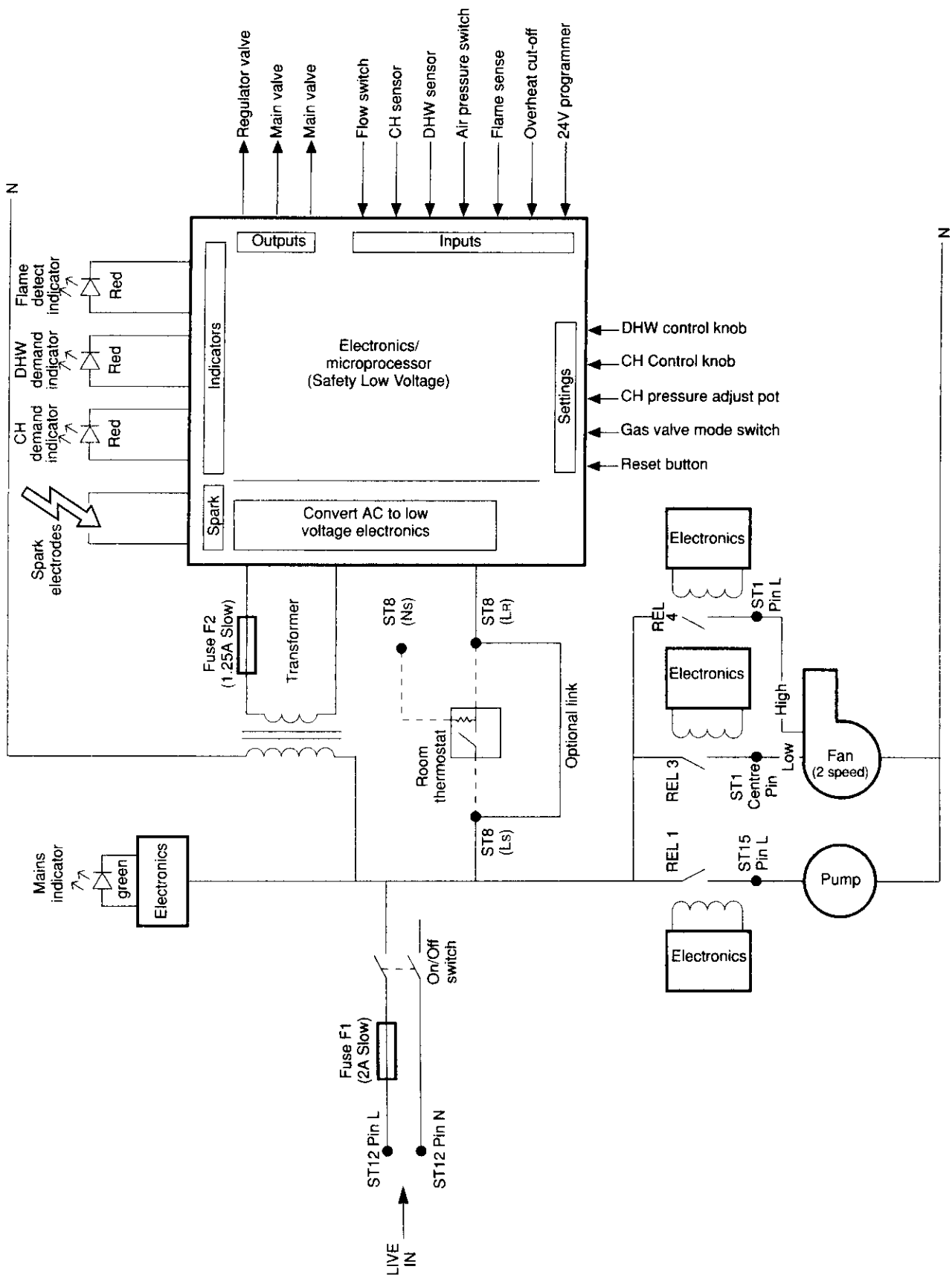


Fig. 11. 230 V room thermostat connections.

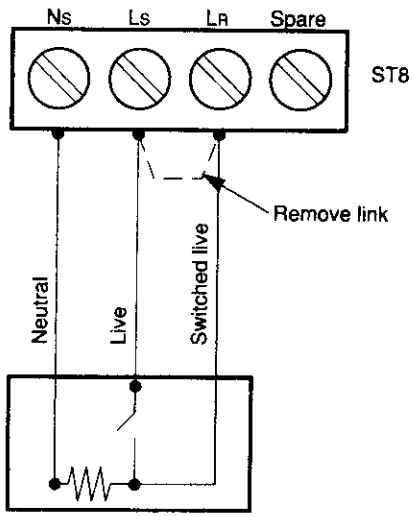


Fig. 12. 230 V programmer connections.

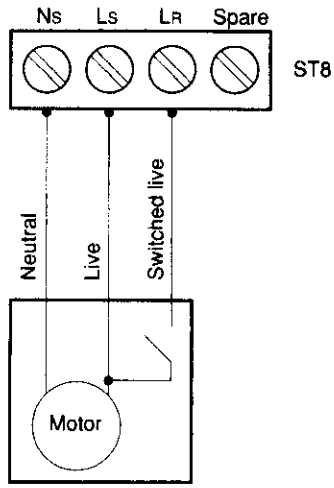
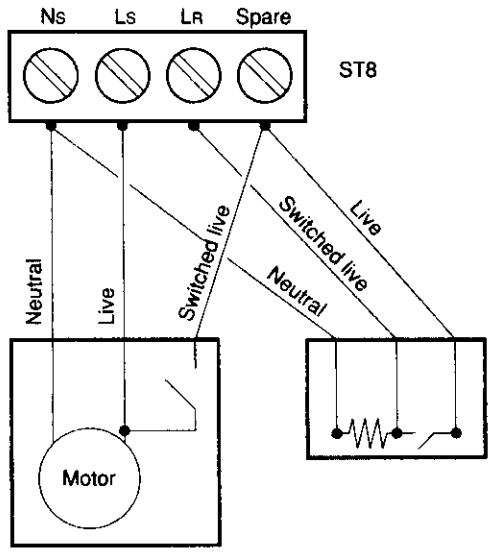


Fig. 13. 230 V room thermostat and programmer connections.



11. Installation

The appliance is supplied suitable for fitting to a sealed system. If it is to be fitted to an open vent system refer to section 8.

11.1 FLUE OPTIONS.

The standard flue length is from 100mm to 650mm measured from the appliance casing to the outer wall.

Extension flue kits, a vertical take-off adaptor, 90° flue bends and 45° flue bends are available to increase the length and redirect the flue as follows.

The maximum flue length is 3000mm.

For each added 90° flue bend 1000mm of flue must be removed.

For each added 45° flue bend 500mm of flue must be removed.

The flue turret can be replaced by a flue bend with no reduction in flue length.

Flue components

1. Appliance casing sealing gasket
2. Flue Turret
3. Flue Collar
4. Air duct to turret sealing ring
5. Standard air duct
6. Standard flue duct
7. Restrictor ring
8. Flue terminal
9. Extension air duct
10. Extension flue duct
11. Flue duct sealing ring
12. In-line flue elbow
13. Vertical flue adaptor

IMPORTANT:

The restrictor ring must not be used for flue lengths over 650mm

The flue must be installed as specified in BS 5440 Part 1.

Fig. 14. Fixing the wall mounting plate.

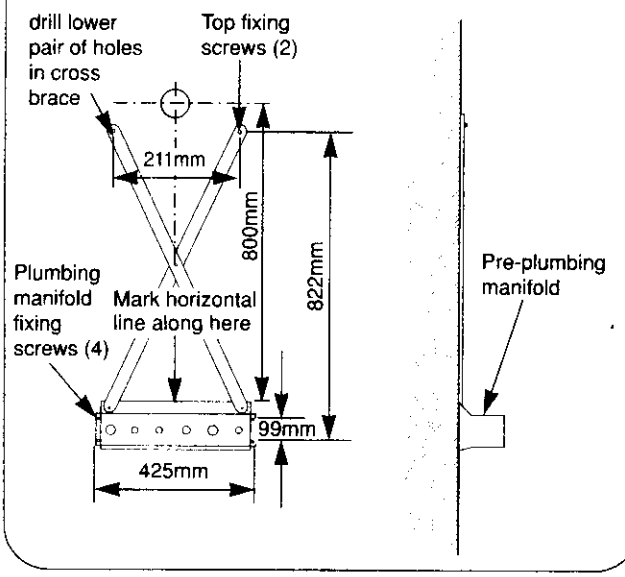


Fig. 16. Flue turret fixing and automatic air vent.

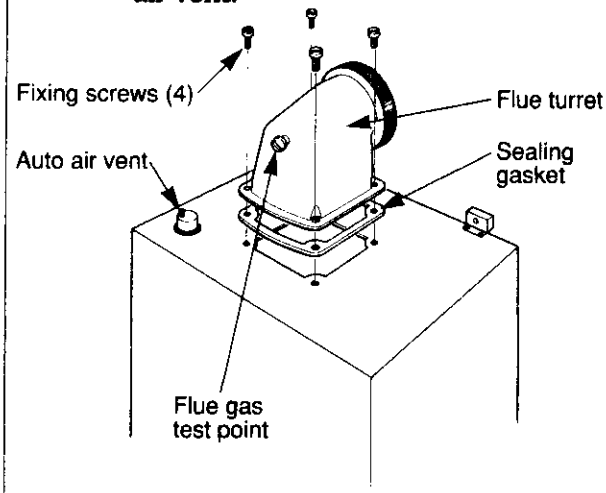
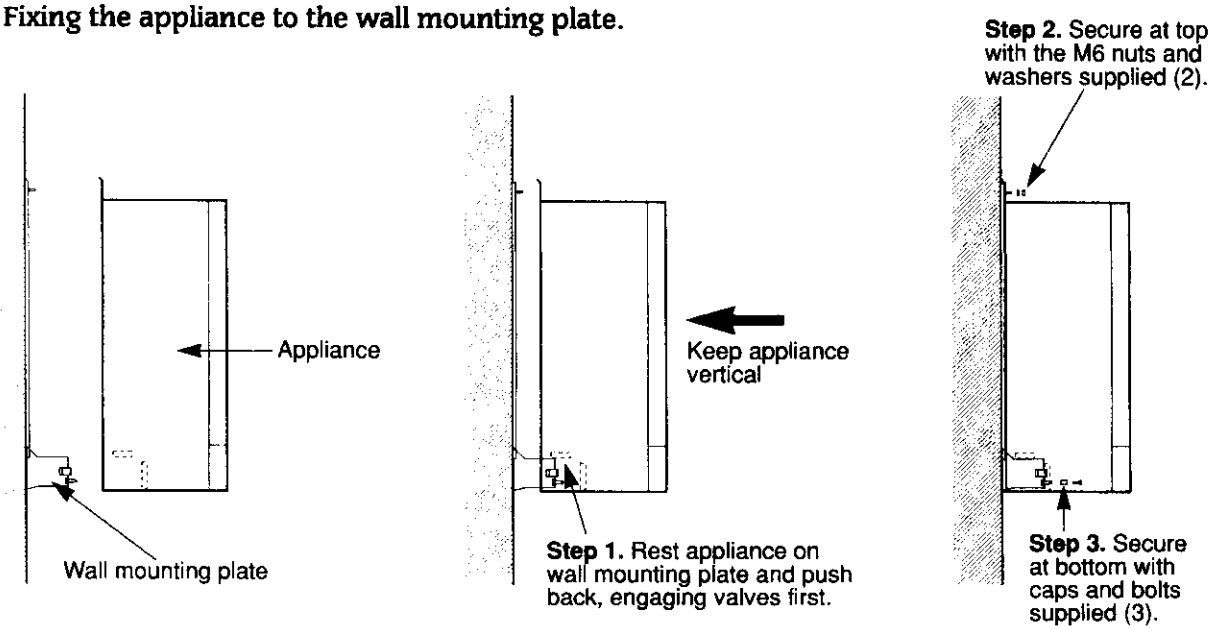


Fig. 15. Fixing the appliance to the wall mounting plate.


Step 2. Secure at top with the M6 nuts and washers supplied (2).
Appliance
Keep appliance vertical
Wall mounting plate
Step 1. Rest appliance on wall mounting plate and push back, engaging valves first.
Step 3. Secure at bottom with caps and bolts supplied (3).

NOTE: READ THIS SECTION FULLY BEFORE COMMENCING INSTALLATION

11.2 GENERAL FITTING.

Check that the appliance carton contains: Appliance, installers instruction pack, pre-plumbing manifold, wall plate cross member, user's information pack and installer's hardware pack.

Assemble the wall plate cross member to the pre-plumbing manifold as shown in Fig. 14 using the two M4 thread forming screws supplied in the hardware pack.

Check that the position chosen for the appliance is in accordance with the instructions given in Sections 4 and 5.

Hold the wall plate to the wall. Check that the plate is horizontal. See Fig. 14.

Leave the pre-fitted plastic cover in place to protect the valves and 'O' rings from dust and dirt during installation.

Mark the position of the fixing holes and the position of the flue hole centre line onto the wall. Draw a horizontal line along the top of the wall plate cross member as shown in Fig. 14.

Rear Flue – Mark a vertical line through the flue hole centre point. Measure upwards 800mm from the horizontal line and mark the point. This is the centre point of the flue duct hole. See Fig. 16.

Side Flue – Extend the horizontal line from Fig. 14 along the appropriate wall. Check that it remains horizontal and measure 800mm upwards and mark a horizontal line. Measure 197mm from the junction of the walls and mark a vertical line which will then give the position of the flue hole.

Drill the six fixing holes 60mm deep for No. 12 size plugs. Cut the flue duct hole at 110mm diameter (150mm dia. for internal fitting). Ensure that the hole is horizontal through the wall.

Fix the wall plate and check that it is horizontal before tightening the six screws.

Connect the gas, water and pressure relief valve connections to the manifold. The primary system should be flushed and treated in accordance with the recommendations of BS 7593:1992.

Remove the plastic cover from the manifold, and make sure that the "O" rings are fitted clean and lubricated.

Slide the appliance onto the pre-plumbing manifold ensuring that the three pegs are located correctly. Secure with the two M6 nuts and washers at the top and screw the appliance to the manifold at the bottom, using the three retaining caps and M6 bolts. See Fig. 15.

Access to these pegs and caps can be made easier by removing the bottom panel.

Unscrew the automatic air vent cap. See Fig. 16.

If the air and flue duct assembly is to be fitted from inside the room then the ducts must be cut to length, assembled and inserted through the wall at this stage before fitting the flue elbow to the appliance. Refer to Section 11.3 following for the assembly of the air and flue ducts.

Remove the fan. See Section 14.3(e).

11.3 AIR AND FLUE DUCT PREPARATION AND ASSEMBLY

Check the contents of the standard flue duct kit against the packing list. Similarly check the extension duct kits if applicable.

Remove all the packing from the ducts and terminal assembly.

The standard flue kit accommodates a flue assembly up to 650mm long measured from the appliance casing to the outer wall face. See dimension L, Figs.17 and 18. When dimension L is greater than 650mm extension flue assemblies will be required.

Measure and cut the air and flue ducts to length ensuring that the cuts are square and free from burrs. Always check the dimensions before cutting the ducts.

Fit the restrictor ring in the flue terminal only when the overall length of the flue is less than 1000mm and no additional flue bends have been fitted.

11.4 EXTERNAL FITTING OF THE DUCT ASSEMBLY

Rear Flue Assembly

Measure distance L. See Fig. 17.

Air duct length = L + 146mm.

Flue duct length = L + 181mm.

Do not cut the drilled end of either duct.

Assemble the air and flue ducts to the terminal. Drill through the holes in the terminal into the air duct and fix using the screws provided. See Fig. 22. Join the extension ducts to the standard ducts as indicated in Fig. 20, making sure the seal is in place. Drill and screw together the air ducts.

From outside, push the assembly through the wall and enter the ducts into the flue outlet turret.

Pull back the air duct slightly to allow access to the flue duct. Drill through the flue duct and fix with the screws provided. Push the air duct into the turret. Drill and fix the air duct to the turret. See Fig. 19.

Align the flue turret with the 4 holes on the appliance and screw down. See Fig. 16.

Make good the internal and external brickwork or rendering.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

Side Flue Assembly

Measure distance L. See Fig. 18.

Air duct length = L + 175mm.

Flue duct length = L + 210mm.

Do not cut the drilled end of either duct.

Assemble the air and flue ducts to the terminal. Drill through the holes in the terminal into the air duct and fix using the screws provided. See Fig. 22. Join the extension ducts to the standard ducts as indicated in Fig. 20, making sure the seal is in place.

Drill and screw together the air ducts.

From outside, push the assembly through the wall and enter the

Fig. 17. Flue duct length (rear flue).

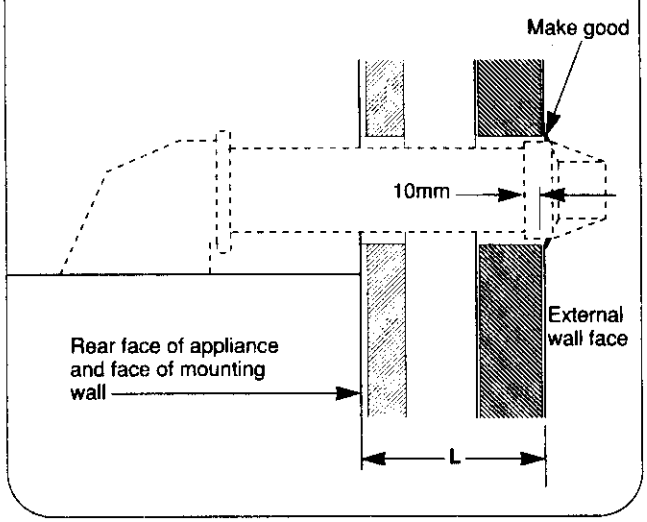


Fig. 18. Flue duct length (side flue).

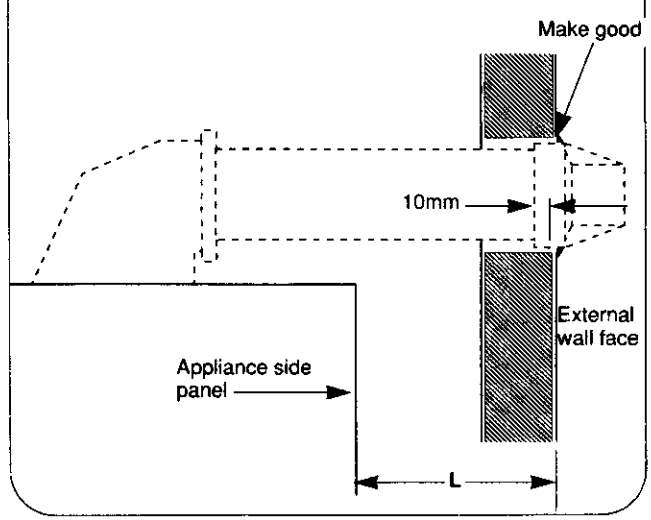


Fig. 19. Flue elbow, ducts and terminal assembly

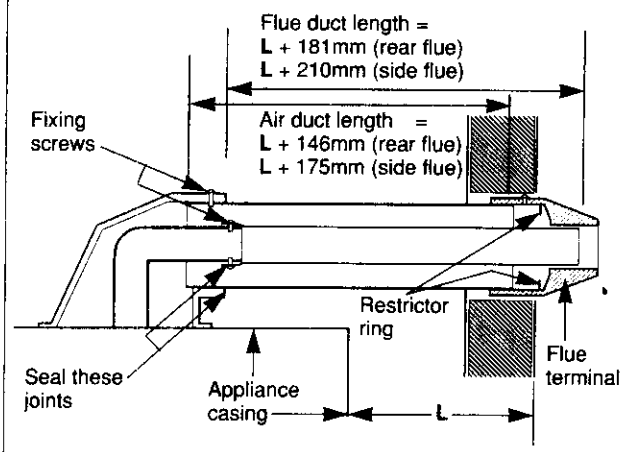


Fig. 21. Terminal assembly for internal fitting of the flue.

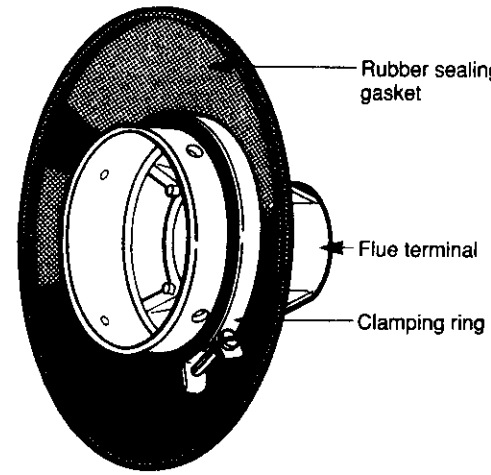


Fig. 20. Flue assembly using extension kits.

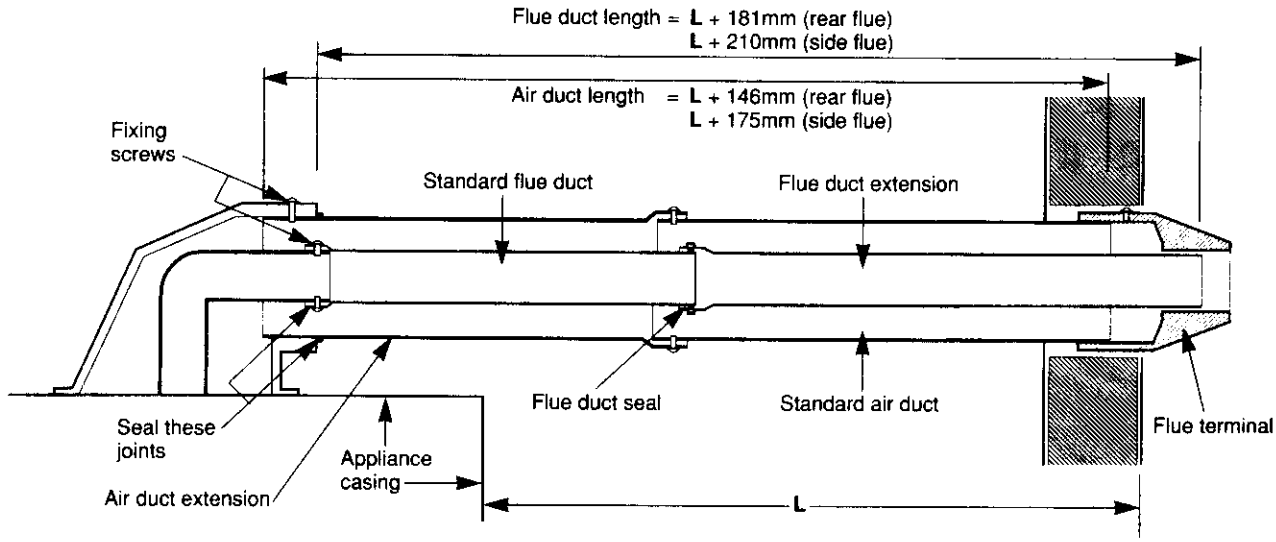
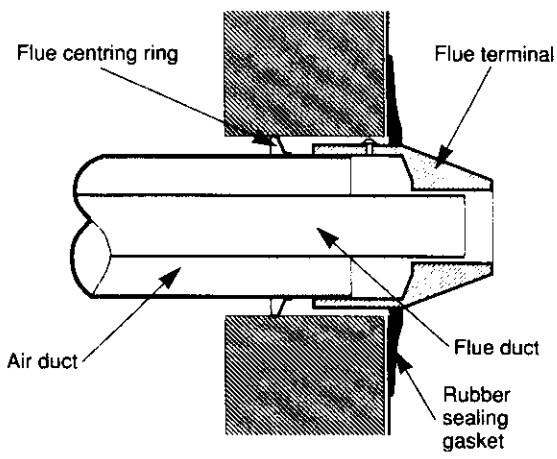


Fig. 22. Duct and terminal assembly for internal fitting of the flue.



ducts into the flue outlet turret.

Pull back the air duct slightly to allow access to the flue duct. Drill through the flue duct and fix with the screws provided. Push the air duct into the turret. Drill and fix the air duct to the turret with the screws provided. See Fig. 19.

Align the flue turret with the 4 holes on the appliance and screw down. See Fig. 16.

Make good the internal and external brickwork or rendering.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

11.5 INTERNAL FITTING OF THE DUCT ASSEMBLY

The rubber sealing gasket and the clamping ring are available from Worcester Heat Systems.

Measure and cut the ducts as previously described for external fitting (Section 11.4). Fix the ducts to the terminal and fit the rubber sealing gasket and clamp to the terminal. Centralise the gasket and tighten the clamping ring. See Fig. 21. Slide the flue centering ring onto the air duct and tighten the screw. See Fig. 22. Fix the ducts and terminal assembly to the flue turret as described in Section 11.4 preceding.

Push the assembly through the wall so that the gasket flange is against the outside face of the wall. See Fig. 22.

Align the flue turret with the 4 holes on the appliance and screw down. See Fig. 16.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

Seal the gap around the duct with the flexible seal provided and make good. See Fig. 22.

11.6. FITTING FLUE BENDS

Flue bends are an optional extra, the 90° bend supplied singularly and the 45° bends being supplied as a pair. The bends can be fitted in any combination as long as the combined equivalent flue length plus length of flue duct does not exceed 3000mm. One 90° bend is equivalent to 1000mm of flue duct and one 45° bend is equivalent to 500mm of flue duct. See Fig. 22a. In between flue bends (or between first bend and vertical take-off adaptor) there is no difference in the length of the air duct and the flue duct. Between the first bend and the flue turret the air duct needs to be 14mm longer than the flue duct. After the last bend the flue duct needs to be cut 15mm longer than the air duct to fit into the terminal. Note the swaged ends of the air ducts and the flue ducts must be removed to connect into the flue bends and all joints between bends and flue must be sealed with silicone sealant.

11.7 FINAL INSTALLATION

Check that all the water and gas connections have been tightened.

If a facia mounted programmer is to be fitted follow instructions with the programmer..

Hinge down the facia as described in Section 14.3(c).

Connect the mains electrical supply to the appliance at terminal ST 12 See Fig. 8. Connect any room and/or frost thermostats. The electrical leads must pass through the appropriate space in the control panel and be fixed with the cable clamps provided. See Figs. 11 and 12. Refit the facia panel.

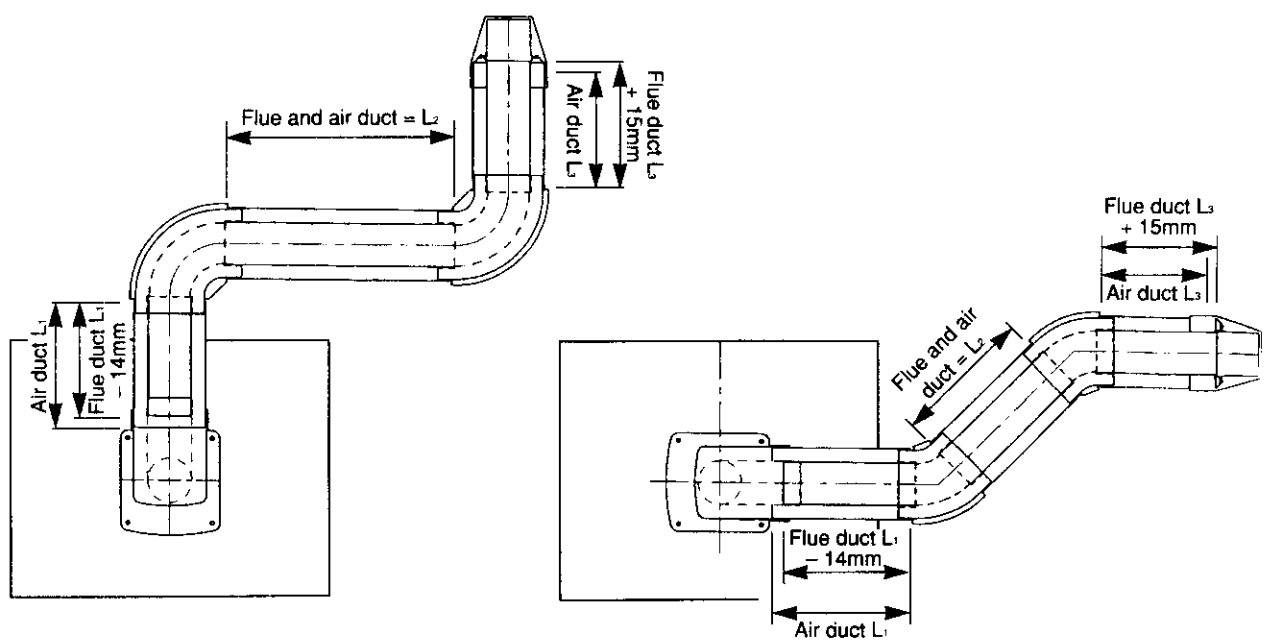
Test the gas supply pipework up to the appliance for soundness as indicated in BS 6891.

Refer to Section 12 for a full description of the filling, venting and the pressurising of the system.

If the appliance is not to be commissioned immediately, replace the cabinet front panel. Check that the gas supply, the electrical supply and the water connections are all turned off.

If the premises are to be left unoccupied during frosty conditions, then drain the appliance and system. For short inoperative periods, leave the appliance under the control of the built in frost thermostat or the remote frost thermostat (if fitted) or leave operating continuously with the room thermostat set at 6°C.

Fig. 22a. Fitting the flue bends to the intermediate sections of the flue duct.


Flue and air duct = L2
Air duct L3
Flue duct L3 + 15mm
Air duct L1
Flue duct L1 – 14mm
Flue duct L3 + 15mm
Air duct L3
Flue and air duct = L2
Flue duct L1 – 14mm
Air duct L1

12. Commissioning

12.1 SUMMARY

The appliance is dispatched with the controls set to provide a maximum output for domestic hot water of 28 kW and 24 kW for central heating.

The appliance automatically modulates to satisfy lower heat loads.

Domestic Hot Water System. Check that the mains water supply has been fully flushed out at installation.

Central Heating System. Check that the central heating system has been fully flushed out at installation.

Gas Service. The complete system, including the meter, must be inspected and tested for soundness and purged as indicated in BS 6891. In the event of a leak, or suspected leak, on the 'O' ring joint on the main appliance manifold, we recommend that a manometer is attached to the test point on the inlet of the multifunctional gas valve and a soundness test carried out after turning off the appliance gas cock; this will test the section between the gas cock and the gas valve, thus enabling the leak to be traced to either a visible joint or to the 'O' ring.

12.2 APPLIANCE AND CENTRAL HEATING SYSTEM – PREPARATION

Remove the cabinet front panel.

Check that the electrical supply and the gas service to the appliance are off.

Check that all the water connections throughout the system are tight.

Open the system valves at the appliance. Open all the radiator valves, fill the system and vent each radiator in turn.

The automatic air vent will vent the appliance. Check that the air vent cap has been loosened.

Fig. 23. Appliance casing and control equipment fixings.

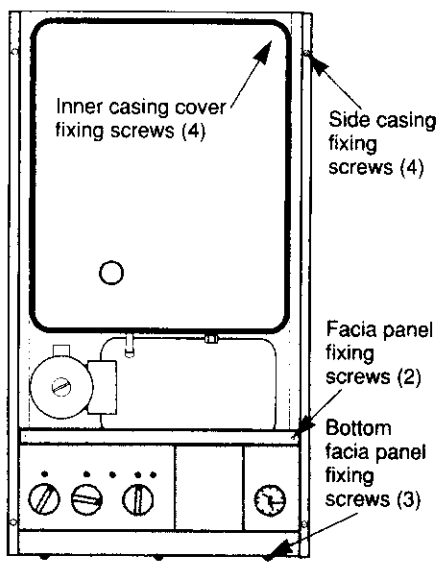
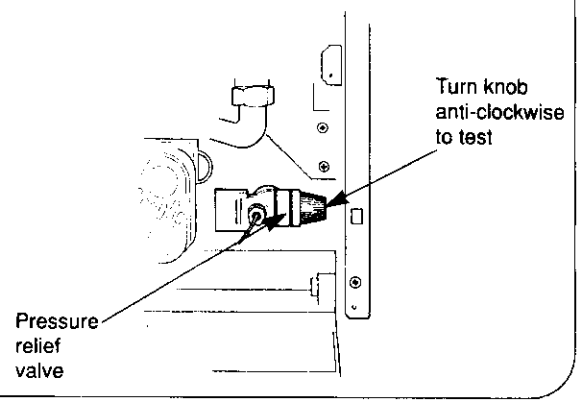

Inner casing cover fixing screws (4)
Side casing fixing screws (4)
Facia panel fixing screws (2)
Bottom facia panel fixing screws (3)

Fig. 24. Pressure relief valve.



Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Water should be expelled from the discharge pipe. See Fig. 24. Lower the control box to gain access. Refer to Section 14.3(c).

Set the Expansion Vessel Pressure

The charge pressure of the expansion vessel as dispatched is 0.5 bar, which is equivalent to a static head of 5 metres (17 ft). The charge pressure must not be less than the static head at the point of connection. See Fig. 7. A Schraeder type tyre valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary.

Set the System Pressure

Remove the bottom panel to gain access to the filling loop assembly.

Insert the bayonet end of the filling key into the corresponding cut outs in the filling loop housing and twist to lock the key in place. (see fig. 26)

Turn the grey knob anti-clockwise to allow water ingress and fill the system untill the pressure gauge shows 2.5 bar (37 lb/in^2)

Turn the grey knob clockwise to stop filling and remove the filling key by lining up the bayonet end of the key with the cutouts in the filling loop housing and withdrawing the key.

Check for water soundness.

Release water from the system using the relief valve test knob (see fig. 24), untill the system design pressure is obtained, up to a maximum of 1.5 bar.

Initial system design pressure (bar) = Expansion vessel charge pressure + 0.3 bar.

NOTE: 1 bar is equivalent to 10.2 metres (33.5 ft) of water.

N.B. The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with Byelaw 14 of the Water Byelaws Scheme.

Store the key in a safe place for future use and refit the bottom panel.

Fig. 25. Gas valve.

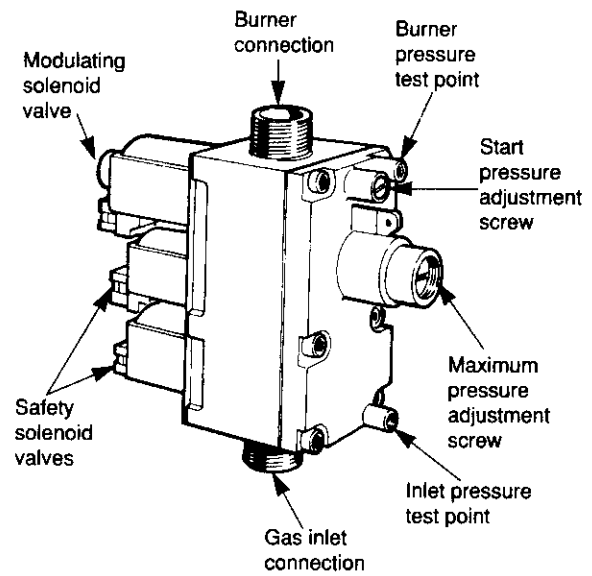
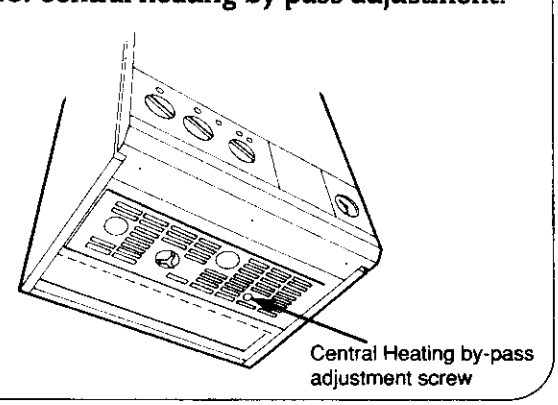


Fig. 26. Central heating by-pass adjustment.



Set the movable pointer on the pressure gauge to coincide with the indicating pointer giving a permanent record of the set system pressure.
If the pressure indicated on the pressure gauge is greater than 2.6 bar when operating at the maximum central heating temperature, an extra expansion vessel must be fitted to the system as close as possible to the appliance central heating return connection.
The appliance (as dispatched) can accommodate a system volume of about 83 litres. Refer to BS 7074 Part 1. If the system volume is in excess of that accommodated by the expansion vessel fitted to the appliance then an extra vessel must be fitted as close as possible to the central heating return connection of the appliance.
Any extra vessel fitted must be pressurised to the same figure as the integral vessel. If the expansion vessel fails then the specified replacement must be fitted.

12.3 PROGRAMMER

Any programmer fitted on the appliance should be set up at this stage following the instructions sent with the programmer.
The programmer will retain the setting for up to three weeks following an interruption in the electricity supply.

12.4 APPLIANCE OPERATION

Turn off the gas and electricity supplies to the appliance.
Loosen the burner pressure test point screw and connect a pressure gauge. See Fig. 25.
Undo the two screws and hinge down the facia.

Setting the Burner Pressure

Check that all the radiator valves are open. Set the room thermostat and the Central Heating Temperature Control to maximum.
On sealed systems check that the system is pressurised and set to the required pressure as indicated on the gauge.
Set the Operating switch (or Programmer) to HEATING & WATER.
Set the gas valve mode switch, at the rear of the facia, to the Test Max. Position.
Turn on a hot water tap.
Turn on the gas and electricity supplies.
A continuous ignition spark will occur until the burner is alight and sensed by the control circuit. The burner will light and remain at its maximum domestic hot water setting. The burner pressure should be 12.1 mbar for natural gas and 35.5 mbar for propane.
Set the gas valve mode switch to the Test Min. position.
The burner pressure will drop to the minimum setting for both central heating mode and domestic hot water mode. The burner pressure should be 1.0 mbar for natural gas and 3.8 mbar for propane.
Set the gas valve mode switch to the normal operation position.
Turn both the central heating control knob and the domestic water control knob to their maximum position (i.e. fully clockwise).
Turn off the hot water tap.
The burner pressure will drop to minimum setting and will ramp up to the maximum central heating setting. The burner pressure should be 8.8 mbar for natural gas and 24.3 mbar for propane.
Test for gas soundness at the joint between the burner and the gas valve with leak detection fluid.
NOTE: The burner pressure is factory set and if (after checking that the supply pressure is sufficient) the correct pressure is not obtained then Worcester Heat Systems Service Department should be contacted.
If the appliance does not light, check that it is not in the "lockout" state by pressing the lockout reset button. See Fig. 27.
Set the gas valve mode switch back to the normal position.
Turn off the electricity supply and then back on again to reset the controls.

Domestic Hot Water

First of all a tap should be opened. Gradually close the hot tap and check that the burner pressure drops. Fully open the tap and check that the burner pressure rises. Fully close the tap and check that the burner goes off. The fan may continue running until the appliance has cooled to a pre-set temperature.
Set the operating switch to OFF.

Central Heating

Set the mode switch to the normal position.
Check that all the radiator valves are open. Set the room thermostat and the Central Heating Temperature Control to maximum.
On sealed systems check that the system is pressurised and set to the required pressure as indicated on the gauge.
Set the Operating Switch (and Programmer) to HEATING & WATER.
Turn on the gas and electricity supplies.
The burner will light.
The appliance will modulate its output between 9.0 and 24.0 kW over a period of about two minutes.
Check the system to ensure that all the radiators are heating up evenly.
Shut down all but one of the radiators and observe the burner pressure fall. Open all of the radiator valves and check that the burner pressure rises.
Balance the system so that the required temperature difference across the central heating flow and return pipes is obtained. See Table 3, page 4.
Adjust the central heating by-pass valve until the same temperature difference is obtained. See Fig. 26. This should be carried out with only a single radiator operating. If thermostatic radiator valves are fitted then one radiator should be left uncontrolled. The bypass valve should never be fully closed.
Set the room thermostat to minimum and check that the burner goes out. Reset the room thermostat to maximum and the burner will re-light and follow the normal operating procedure.
Check for proper ignition of the burner after a break in the gas supply. Turn off the gas service cock and wait for 60 seconds. The burner will go out but sparking from the electrode will continue for 10 seconds when the appliance will enter a 'lockout' state. Carefully open the gas service cock, press the lockout reset button and observe the burner re-light and follow the normal sequence of operation.
Set the Operating Switch to OFF.
Turn off the gas service cock and the electrical supply to the appliance.
Drain the system while the appliance is still hot.
Refill, vent and, with a sealed system, re-pressurise as described in Section 12.2.

Domestic Hot Water and Central Heating

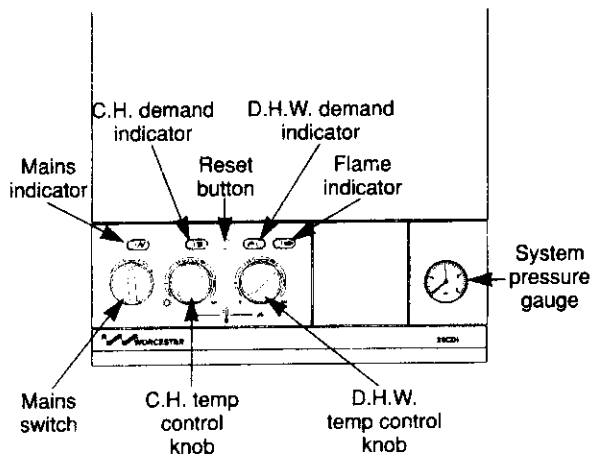
Set the gas valve mode switch to the normal position.
Turn on the electricity supply to the appliance and open the gas supply cock at the appliance.
Set the Operating Switch (and Programmer) to HEATING & WATER.
If a programmer is fitted, set the domestic hot water to Continuous or 24Hrs and the central heating to ON. The burner will light and heat will pass into the system. Turn on a hot water tap and check that fully heated hot water is discharged from the tap.
Close the tap and the burner will go off. The appliance will then return to the central heating mode and automatically balance with the system requirements.
Set the Operating Switch to OFF and the burner will go out.

12.5 COMPLETION OF COMMISSIONING

Disconnect the pressure gauge and tighten the test point screw.
Restart the appliance and check for gas soundness around the test point screw.
Refit the cabinet front panel.
If the appliance is being passed over to the user immediately, refer to Section 13 – Instructions to the User and set the controls to the users requirements.
If the appliance is to be left inoperative, check that the Operating Switch is set to OFF. Turn off the gas service cock and switch off the electricity supply.
If there is any possibility of the appliance and system being left inoperative during frosty conditions, drain the appliance and system. If the premises are to be left unoccupied during frosty conditions, then drain the appliance and system. For short inoperative periods, leave the appliance under the control of the built in frost thermostat or the remote frost thermostat (if fitted) or leave operating continuously with the room thermostat set at 6°C.

13. Instructions To The User

Fig. 27. User controls.



13.1 Tell the user how to operate the appliance and hand over the Users Instructions leaflet.

13.2 Tell the user what to do if the heating system is not to be used in frosty weather.

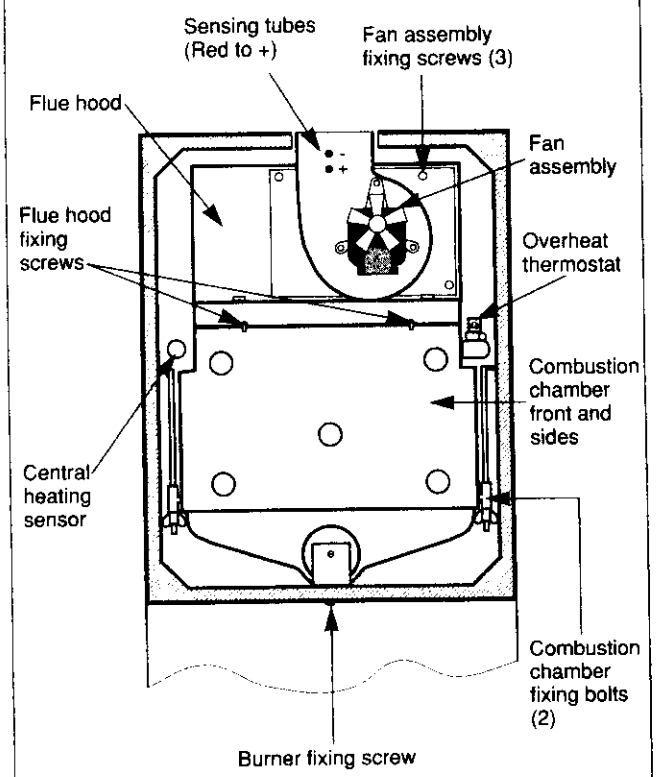
13.3 Tell the user the sealed system set pressure.

13.4 Tell the user of the importance of regular servicing. Worcester Heat Systems Ltd. offer a comprehensive maintenance contract.

13.5 Set the system controls to the user's requirements.

13.6 If an external programmer has been fitted which has a programmable domestic hot water facility then it is suggested that this be set to Continuous or the equivalent.

Fig. 28. Appliance components and fixings (upper assembly).



14. Inspection And Servicing

14.1 SERVICING

To ensure continued efficient operation of the appliance it must be checked and serviced as necessary at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but once per year should generally be adequate. The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers.

Any service work must be carried out by competent engineers such as British Gas or Corgi registered personnel.

14. 2 PRE-SERVICE INSPECTION

Check that the flue terminal and the terminal guard, (if fitted), are clear.

If the appliance is in a compartment, check that the ventilation openings in the compartment door or walls are clear. See Section 6 – Air Supply.

Check the system and remake any joints or fittings which show signs of leakage.

Refill, vent and re-pressurise as described in Section 12.2.

Operate the appliance and the system taking note of any faults.

Measurement of the Flue Gases

For consistency of results of the flue gas measurements it is necessary to have a constant output and stationary equilibrium.

Switch on the appliance.
Switch to DHW and CH mode.
Hinge down the facia.
Turn the Mode Switch to the "Max." position.
Turn on a hot tap.
Wait until the appliance reaches stationary equilibrium (approx. 10 minutes).
Remove the sealing screw on the flue turret. See Fig. 16.
Insert the probe into the measurement gap up to a depth of 50mm.
Seal any gaps.

Expected measurements should be between:

CO: 0.001 and 0.003%.
CO_2: 6.7 and 7.0%.

After taking the measurement:

Replace and tighten the sealing screw.
Turn the Mode Switch back to the "normal" position.
Put the facia back in to the correct position.

IMPORTANT

Disconnect the electrical supply at the mains and turn off the gas supply at the gas service cock on the appliance before servicing.

After completing the service always test for gas soundness as indicated in BS 6891.

14. 3 DISMANTLE THE APPLIANCE

To carry out a full and comprehensive service of the appliance remove the following parts to gain access to the components which need to be checked or serviced.

(a) Cabinet Front Panel. Remove by lifting off the supports.

(b) Inner Casing Cover. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel. Unscrew the four screws securing the cover to the casing and lift off. See Fig. 23.

(c) Facia Panel. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel. Unscrew the two upper screws as shown in Fig. 23 and hinge down the facia taking care not to damage the pressure gauge capillary tube or electrical connections.

(d) Bottom panel. Hinge down the facia panel. Disengage the front edge of the bottom panel from the two clips and remove from appliance

(e) Fan. Remove the inner casing cover. Carefully unplug the electrical connections and pull off the sensing tubes. Unscrew the three fixing screws and remove the fan assembly. See Fig. 28.

(f) Flue Hood Assembly. Remove the fan assembly. Undo the two screws securing the flue hood. Lift and slide the flue hood

assembly from the appliance. See Fig. 28. When refitting the hood ensure that the rear return edge passes under the lip at the rear of the combustion chamber.

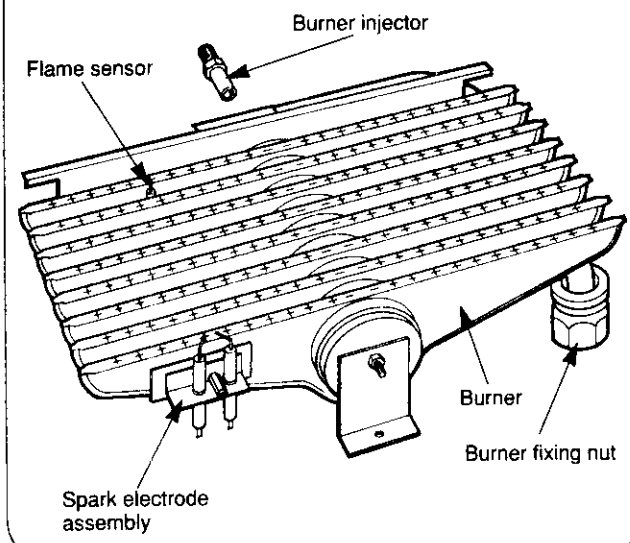
(g) Combustion Chamber Front and Sides. Remove the inner casing cover and flue hood assembly. Unscrew the two wing nuts securing the front and sides and remove from the appliance. See Fig. 28.

(h) Burner Assembly. Remove the combustion chamber front and sides. Pull off the two spark electrode leads and disconnect the flame sense lead. Undo the G $^{3}/_{4}$ inch nut on top of the gas valve. Undo the burner fixing screw. Lift up and remove the burner assembly from the appliance.

14. 4 SERVICE OF COMPONENTS

Clean the Fan. Any dust or fluff should be removed with a soft brush or by blowing. Take care not to distort the pressure sensing device.

Fig. 29. Burner and electrode.



Clean the Main Burner. Brush the blade tops and mixing tube with a soft brush and check that all the flame ports are clear. Remove any blockages with a non-metallic brush. Inspect the injector and clean with a soft brush. Replace the injector if it appears damaged. Do not use a wire brush or anything likely to cause damage. Replace the spark and sense electrodes if they appear damaged.

Clean the Gas to Water Heat Exchanger. Cover the burner manifold hole in the combustion chamber bottom panel with a cloth. Clean the heat exchanger using a soft brush. Remove the deposits from the bottom of the combustion chamber. Do not distort any of the blades.

Combustion Chamber Insulation. Examine and replace any pads that are damaged. Remove any dust or deposits using a soft brush.

Reassemble the appliance in the reverse order.

Check that all components are in place and correctly fixed. Leave the cabinet front panel to be fitted after checking the operation of the appliance.

14. 5 TEST THE APPLIANCE

On completion of the service and reassembly of the appliance, check for gas soundness and the correct operation of the appliance as described in Section 12 – Commissioning.

Refit the cabinet front panel and reset the controls to the users requirements.

15. Replacement Of Parts

15.1 IMPORTANT

Switch off the electricity and gas supplies before replacing any components. After the replacement of any components, check for gas soundness where relevant and carry out functional checks as described in Section 12 – Commissioning.

15.2 COMPONENT ACCESS

To replace components it is necessary to remove one or more sections of the cabinet and cover plates within the appliance as described in Section 14.3. The facia panel may also need to be hinged down as described in Section 14.3 (c).

15.3 DRAINING THE APPLIANCE

Check that the electricity supply to the appliance is turned off. Before removing any component holding water it is important that as much water as possible is removed from the appliance.

(a) Central Heating Circuit. Turn off the central heating flow and return valves at the appliance. Fit tubes to the drain taps on the flow and return manifolds and open the drain taps about one turn, make sure that the dust cap on the auto air vent is loosened. See Fig. 16. Close the drain taps when the flow has stopped. Be careful **not to overtighten** the drain taps. Some water will remain in the expansion vessel, pump, diverter valve, water to water and Gas to Water heat exchangers and extra care must be taken when removing these components.

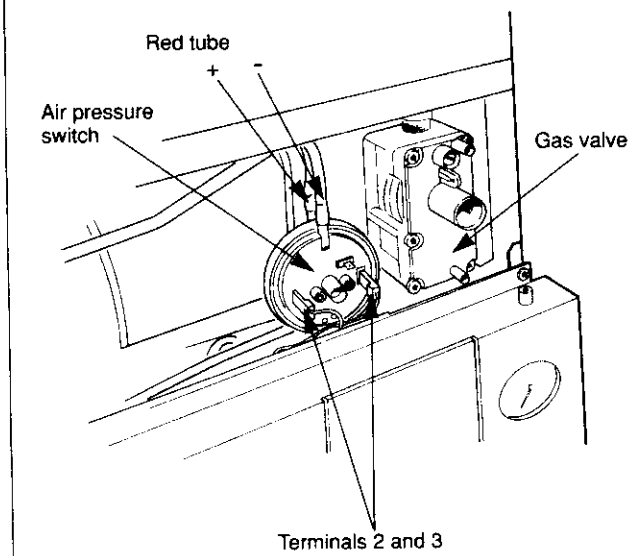
(b) Domestic Hot Water Circuit. Turn off the mains cold supply valve at the appliance and open the lowest hot water tap. A quantity of water will remain in the Water to Water heat exchanger and the diverter valve and extra care must be taken when removing these components.

15.4 COMPONENT REPLACEMENT

1. **Automatic Air Vent.** See Fig. 31.

Remove the inner casing cover as described in Section 14.3 (b).
Drain the central heating circuit as described in Section 15.3 (a).
Remove the circlip and lift the assembly from the appliance.
Unscrew air vent from the pipe. Check the condition of the fibre washer.
Fit the replacement assembly, making sure the 'O' ring is in good condition.
Ensure that the circlip is correctly fitted and the dust cap is loosened.
Open the valves and fill and re-pressurise the system as described in Section 12.2.

Fig. 30. Air pressure switch.



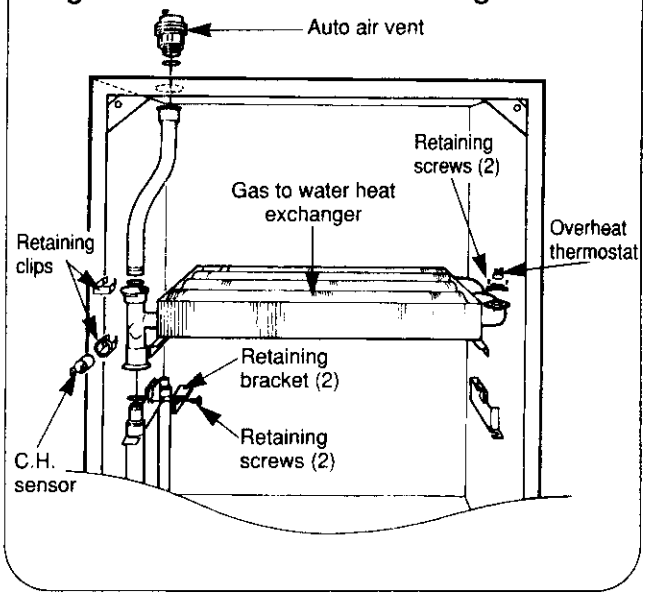
AIR PRESSURE SWITCH

2. Air Flow Pressure Switch. See Fig. 30.
Check that the electricity supply to the appliance is turned off.
Remove the cabinet front panel as described in Section 14.3 (a).
Carefully pull off the sensing tubes and the electrical connections from the switch.
Unscrew the two screws underneath the gas valve and remove the switch and bracket from the appliance.
Fit the replacement switch in the reverse order ensuring that the electrical connections have been made to the correct terminals on the switch. Check that the sensing tubes are fitted correctly.

3. Fan. See Fig. 28.
Check that the electricity supply to the appliance is turned off.
Remove the fan assembly as described in Section 14.3(e).
Fit the replacement fan in the reverse order.
Black wire to terminal No. 1. Red wire to terminal No. 3. White wire to terminal No. 4.

4. Overheat Thermostat. See Fig. 31.
Check that the electricity supply to the appliance is turned off.
Remove the inner casing cover as described in Section 14.3 (b).
Carefully pull off the two wires from the thermostat head.
Undo the two M3 screws and remove from the appliance.
Fit the replacement thermostat in the reverse order ensuring that some heat sink compound is between the thermostat and the plate.

Fig. 31. Gas to water heat exchanger.



5. Gas to Water Heat Exchanger. See Fig. 31.
Check that the electricity supply to the appliance is turned off.
Drain the central heating circuit as described in Section 15.3 (a).
Remove the inner casing cover, fan, flue hood assembly, overheat thermostat, central heating sensor, burner and automatic air vent assembly as described in Sections 14.3 (b, e, f, g and h), 15.4 (1), 15.4 (4) and 15.4 (13).
Slacken the two screws to remove the two retaining brackets and lift the heat exchanger from the casing.
Fit the replacement heat exchanger in the reverse order ensuring that both the "O" rings are correctly fitted and lubricated and a layer of heat sink compound is on both the thermostats.
Open the valves and fill and re-pressurise the system as described in Section 12.2.

7. Combustion Chamber Insulation.
Check that the electricity supply to the appliance is turned off.
Drain the central heating circuit as described in Section 15.3(a).
Remove the inner casing cover, fan, flue hood assembly, burner, and Gas to Water heat exchanger as described in Sections 14.3 (b, e and f), and 15.4 (5). Remove the fibre insulation pads from the combustion chamber side, rear, and front sections.
Fit the replacement pads in the reverse order taking care not to damage them.
Open the valves and fill and re-pressurise the system as described in Section 12.2.

8. Burner.
Check that the electricity and gas supplies to the appliance are turned off.
Remove the burner assembly as described in Section 14.3 (h).
Fit the replacement burner in the reverse order taking care not to damage the electrode leads.

9. Burner Injector. See Fig. 29.
Remove the burner as described in Section 14.3 (h).
Unscrew the brass injector from the burner.
Fit the replacement injector in the reverse order.

10. Spark Electrode Assembly. See Fig. 29.
Remove the combustion chamber front and sides as described in 14.3 (g)
Carefully pull off the two electrode leads,
Undo the M4 extended nut and remove the spark electrode assembly from the burner.
Fit the replacement electrode in the reverse order, checking that the spark gap is 3 to 4mm.

11. Flame Sensor. See Fig. 29.
Remove the burner as described in sections 14.3(h) and 15.4(8).
Undo the M3 screw and remove the sense electrode from the burner.
Fit the replacement electrode in the reverse order, checking that the sense gap is 5 to 6mm.

12. Gas Valve. See Fig. 25.
Check that the electricity and gas supplies to the appliance are turned off.
Hinge down the control box assembly in the servicing position as described in Section 14.3(d).
Undo the two G¾ inch nuts on the gas valve and the two M4 screws on the gas valve bracket and remove the valve from the appliance.
Whilst supporting the valve carefully pull off the three electrical solenoid plug connections.
Fit the replacement gas valve in the reverse order ensuring the sealing washers are correctly fitted.
Turn on the gas supply and check for soundness.

To set the burner pressure. See Fig. 25.
After a new gas valve has been fitted the burner pressures must be set.
Follow the procedure described in Section 12.4 – Appliance Operation.
Turn both the central heating control knob and the domestic water control knob to their maximum position (i.e. fully clockwise).
The maximum domestic hot water burner pressure must be set first as it effects the other pressures.
Turn the gas valve mode switch to the maximum position and open a hot water tap.
Adjust the maximum pressure adjustment screw on the gas valve to give a burner pressure of 12.1 mbar for natural gas (G20).
For propane (G31) the maximum pressure adjustment screw should be fully screwed in to give a pressure of 35.5 mbar.
Close the hot water tap and turn the gas valve mode switch to the minimum position.
Adjust the start pressure adjustment screw on the gas valve to give a burner pressure of 1.0 mbar for natural gas (G20) or 3.8 mbar for propane (G31).
Turn the gas valve mode switch to the normal position.
Ensure the appliance lights in the central heating mode.
Turn the CH pressure adjuster fully clockwise, wait until the burner pressure has stopped increasing and then slowly turn the CH pressure adjuster anti-clockwise until the burner pressure is 8.8 mbar for natural gas (G20) or 24.3 mbar for propane (G31).
After completing the adjustments, check the pressure settings and re-adjust as necessary.

13. Central Heating Sensor. See Fig. 31.
Remove the inner casing cover as described in Section 14.3(b).
Check that the electricity supply to the appliance is turned off.
Carefully pull off the two leads from the sensor.
Pull off the sensor and spring retaining clip from the pipe.
Fit the replacement sensor in reverse order with a layer of heat sink compound between the faces. Refit the leads.

14. Domestic Hot Water Sensor.
Check that the electricity supply to the appliance is turned off.
Hinge the facia assembly in the servicing position as described in Section 14.3(c and d).
Carefully pull off the two leads from the sensor.
Undo and remove the screw, pull off the sensor and spring retaining clip from the pipe.
Fit the replacement sensor in the reverse order ensuring a layer of heat sink compound is between the faces. Refit the leads.

15. Circulating Pump.
Check that the electricity supply to the appliance is turned off.
Drain the central heating circuit as described in Section 15.3(a).
Hinge the facia assembly in the servicing position as described in Section 14.3(d).
Undo the two union nuts and the pipe to the expansion vessel, remove the pump from the pipe-work. Support the pump and remove the electrical cover.
Disconnect the electrical wires taking note of their positions.
Fit the replacement pump in the reverse order using new sealing washers.
(Alternatively replace the pump head only by removing the four Allen screws on the pump, remove the head and support whilst removing the electrical connections. Refit the new head).
Open the valves and fill and re-pressurise the system as described in Section 12.2

NOTE: The direction of flow should be downwards. The speed should always be set to maximum.

16. Expansion Vessel.
Drain the central heating circuit as described in Section 15.3(a).
Hinge the facia assembly in the servicing position as described in Section 14.3(d).
Remove the air pressure switch, gas to water heat exchanger, water to water heat exchanger and pump as described in 15.4 (2), (5), (15) and (20) and remove the vessel.
Fit the replacement vessel in the reverse order.
Open the valves and fill and re-pressurise the system as described in Section 12.2

17. Pressure Relief Valve. See Fig. 24.
Drain the central heating circuit as described in Section 15.3(a).
Hinge down the facia assembly as described in Section 14.3(c)
Remove the Bottom panel as described in Section 14.3(d)
Remove the pressure gauge connection, pull out the retaining clip, undo the discharge pipe connection and remove the valve taking care not to distort the pipework.
Fit the replacement valve in reverse order. Reconnect the discharge pipe.
Open the valves and fill and re-pressurise the system as described in Section 12.2

18. Water Diverting Valve Micro Switch Assembly.
Check that the electricity supply to the appliance is turned off.
Hinge down the facia assembly as described in Section 14.3(c).
Remove the Bottom panel as described in Section 14.3(d)
Using a pair of fine nosed pliers, pull the circlip off and remove the micro switch assembly from the valve. Remove the black cover and carefully pull off the connections from the terminals on the micro switches.
Withdraw the switch assembly from the appliance.
Fit the replacement micro switch assembly in the reverse order.

19. Water Diverting Valve.
Check that the electricity supply to the appliance is turned off.
Drain the central heating and domestic hot water circuits as described in Sections 15.3 (a and b).
Hinge down the facia assembly in the servicing position as described in Section 14.3.(c).
Remove the Bottom panel, water to water heat exchanger, micro switch assembly and filling loop as described in Section 14.3(d) and 15. 4 (20) and (24).
Undo all the water connections to the valve.
Fit the replacement valve in the reverse order ensuring that the filter and all fibre washers and 'O' rings are in place and lubricated.
Open the valves and fill and re-pressurise the system as described in Section 12.2.

20. Water to Water Heat Exchanger.
Check that the electricity supply to the appliance is turned off.
Drain the central heating and domestic hot water circuits as described in Sections 15.3(a and b).
Hinge down the facia assembly in the servicing position as described in Section 14.3(c).
Remove the Bottom panel as described in Section 14.3(d).
Remove the filling loop as described in Section 15.4 (24). Undo the diverter valve connection. Remove the bolt and circlip and pull the heat exchanger forward and away from the appliance.
Fit the replacement heat exchanger in the reverse order.
Open the valves and fill and re-pressurise the system as described in Section 12.2

21. Domestic Hot Water Flow Restrictor.
Remove the water to water heat exchanger assembly as described in Section 15.4.20.
The plastic flow restrictor is located within the brass housing on the heat exchanger.
Fit the replacement flow restrictor and reassemble in the reverse order ensuring the fibre washers and 'O' rings are in place.

22. Pressure Gauge.
Check that the electricity supply to the appliance is turned off.
Drain the central heating circuit as described in Section 15.3(a).
Remove the two upper screws and hinge down the facia panel as described in Section 14.3(c).
Remove circlip and pull out the capillary sensing bulb in the return manifold.
Prize back the retaining clips securing the gauge to the facia panel and remove.
Fit the replacement gauge in the reverse order ensuring the "O" ring is in place.
Open the valves and fill and re-pressurise the system as described in Section 12.2

23. Control Board.
Check that the electricity supply to the appliance is turned off.
Undo the 3 screws and remove the facia bottom panel.
Carefully pull off all the connectors. Disconnect the mains supply lead at terminal ST 12and the earth connection at the back.
Remove the two upper screws and hinge down the facia assembly.
Remove the plastic water cover.
Remove the four corner screws on the back of the facia and separate the metal back panel from the plastic facia.
Release the four plastic pillars on the control board and pull forward off the back panel.
Remove transformer from rear of board.
Fit the replacement board in the reverse order ensuring it is pushed firmly onto the four posts and clicks into place.
Refit the facia panel and hinge the control box assembly in the servicing position as described in Section 14.3 (c).

24. Filling Loop.
Check that the electricity supply to the appliance is turned off.
Drain the central heating circuit as described in Section 15.3 (a).
Remove the two upper screws and lower the facia.
Undo the two screws and slide the filling loop assembly to the left and remove from the appliance.
Fit the replacement assembly in the reverse order.
Open the valves and fill and re-pressurise the system as described in Section 12.2.

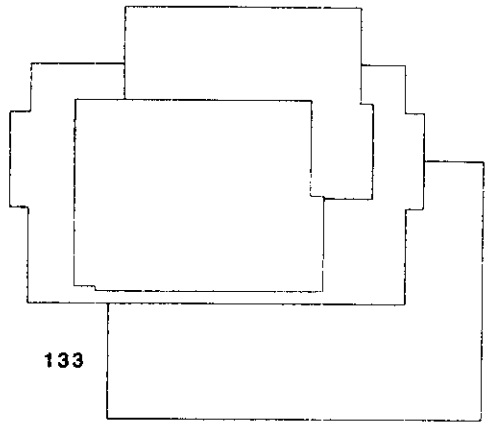
25. Transformer.
Check that the electricity supply to the appliance is turned off.
Remove the control board as described in Section 15.4 (23).
Pull the transformer from the back of the control board.
Fit the replacement transformer in the reverse order.

16. Short Parts List

Key No.	G.C. No.	Part	Manufacturer's Reference	Qty	WHS Part No.
26	378 312	Gas Valve	Junkers Bosch, Type CE 426	1	8 747 003 366 0
78	E00-720	Burner – Natural Gas	Aeromatic, Ref. AC 23/05 3584	1	8 716 142 603 0
78	E00-737	Burner – Propane	Aeromatic, Ref. AC 23/05 3585	1	8 716 142 605 0
80	E00-721	Burner Injector – Natural Gas	Stereomatic, Type 7, Rs'/₈ 4.9mm	1	8 716 140 223 0
80	E00-738	Burner Injector – Propane	Stereomatic, Type 7, Rs'/₈ 3.1mm	1	8 716 140 222 0
81	375 697	Spark Electrode Assembly	Buccleuch, Ref. BE/3462/SI	1	8 716 142 100 0
82	E01 612	Flame Sensor + Harness	Buccleuch, Ref. BE/3461/SI	1	8 716 120 345 0
95	299 515	Ignition Harness	Buccleuch, Ref. BE/3469/SI	1	8 716 120 229 0
61	299 352	Gas to Water Heat Exchanger	Giannoni, Ref. PR22 323 003, spec. D2107	1	8 716 142 800 0
68	E00 716	Automatic Air Vent	Intermes, Ref. 02.05.010	1	8 716 140 500 0
85	299 506	System Pressure Gauge	Cewal, spec. D2111	1	8 716 142 300 0
40	375 699	Pressure Relief Valve	Caleffi, Ref. 312439	1	8 716 142 404 0
29	173 006	Circulating Pump	Grundfoss, Ref. 50 50 6500	1	8 716 143 108 0
25	173 001	Expansion Vessel	Zilmet, Ref. 301010	1	8 716 142 514 0
42	E00-711	Water to Water Heat Exchanger	Giannoni, Ref. PVW 14 E	1	8 716 142 903 0
34	173 005	Diverter Valve	Giannoni, Ref. V37/OM/I/F/4/A spec D2109	1	8 716 156 746 0
104	394 291	DHW Flow Restrictor	Type E 10 litre	1	8 716 141 057 0
105		Domestic Water Filter	MPM, V3326	1	8 716 148 400 0
109	E01-840	Charging Link Assembly		1	8 716 120 320 0
84	E00-722	Circuit Board	Junkers Bosch, Type Heatronic II 282	1	8 748 300 276 0
96	299 516	Transformer	ERA, Ref. BV 066-0188.0	1	8 717 201 248 0
65	E00-716	Fan Assembly	WHS	1	8 716 120 282 0
66	299 363	Air Pressure Sensing Probe	WHS	1	8 716 141 000 0
129	E00-730	Differential Air Pressure Switch	Huba, Ref. 605.99482	1	8 716 146 153 0
60	375 696	Thermister Sensor	Elmwood, Ref. 6655 - 9003 - 5	2	8 716 142 302 0
62	173 015	Overheat Thermostat	Elmwood, Ref. 2455 R - 98 - 789	1	8 716 142 303 0
133	299 354	Combustion Chamber Insulation Pack	WHS	1	7 716 192 204 0
134	299 355	Fibre Washer Pack	WHS	1	7 716 192 205 0
135	299 356	'O' Ring Pack	WHS	1	7 716 192 207 0
136	299 357	Fuse Pack	WHS	1	7 716 192 206 0

Accessories For 28CDi RSF

G.C. No.	Part	WHS Part No.
E01 054	Standard 650 mm Flue Duct & Terminal	7 716 191 009
E01 055	840 mm Flue Duct Extension	7 716 191 010
E01 056	Vertical Balanced Flue Kit 500 mm Duct & Terminal	7 716 191 011
E01 057	Vertical Flue Adaptor	7 716 191 012
299 361	Digital Single Channel Programmer	7 716 192 003
299 360	Mechanical Single Channel Programmer	7 716 192 002
E01 053	Digistat CD (Radio Controlled Room Thermostat)	7 716 192 006
E01 613	Wall Spacing Frame	7 716 192 111
E01 058	90° Flue Elbow	7 716 191 013
E01 059	45° Flue Elbow (Pack of Two)	7 716 192 014
299 359	RSF Open Vent Kit	7 716 192 107
E01 614	Mini Expansion Vessel	7 716 192 105
299 275	Internal Flue Fixing Kit	7 716 191 018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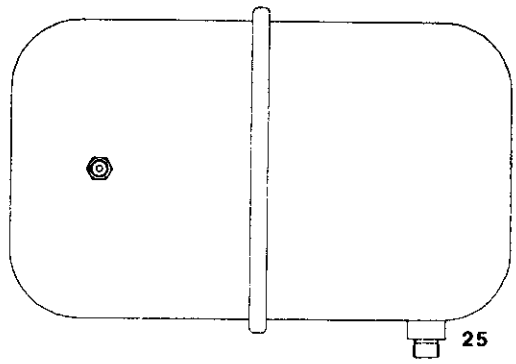
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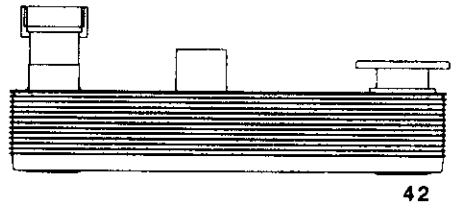
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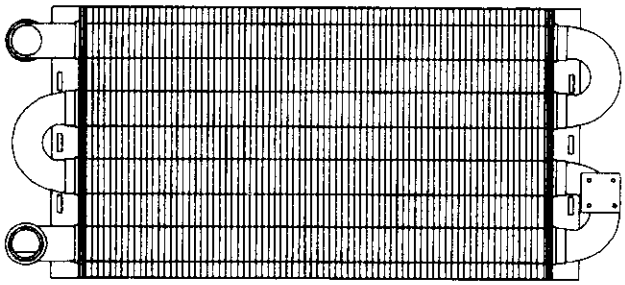
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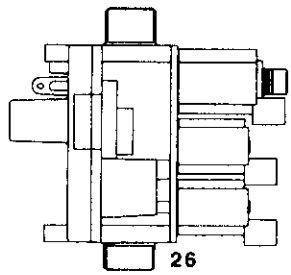
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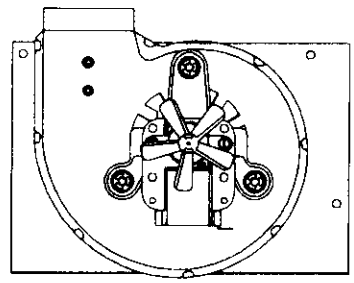
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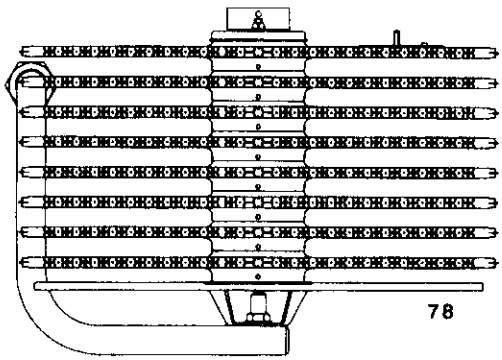
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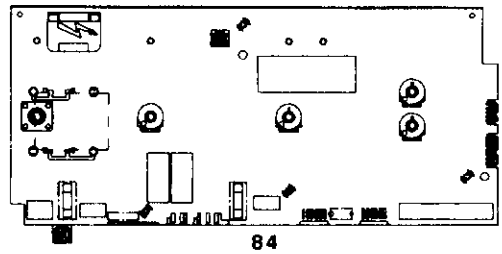
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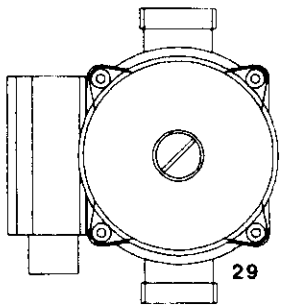
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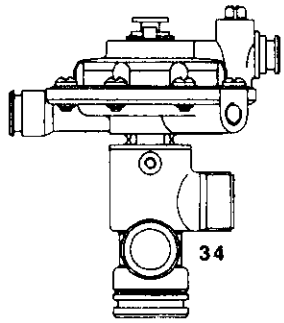
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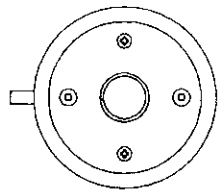
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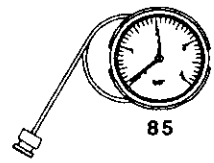
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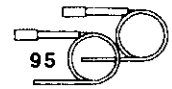
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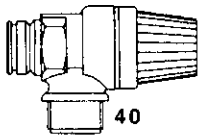
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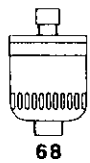
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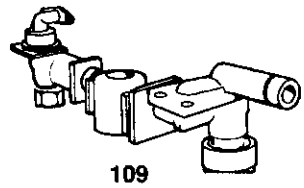
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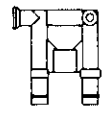
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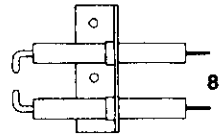
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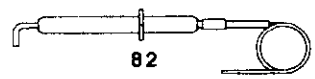
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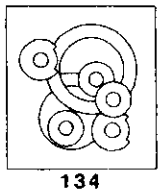
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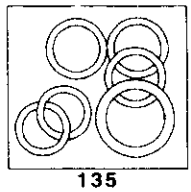
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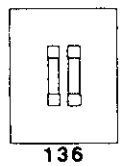
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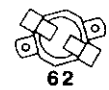
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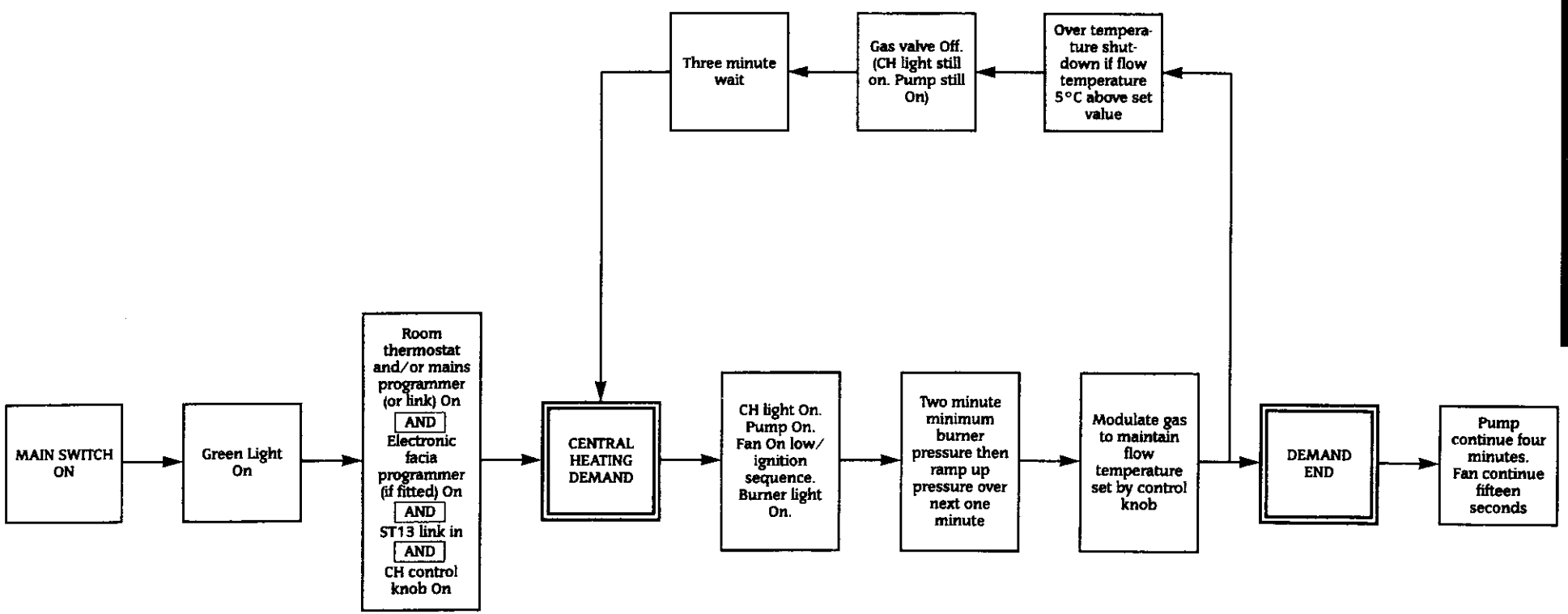
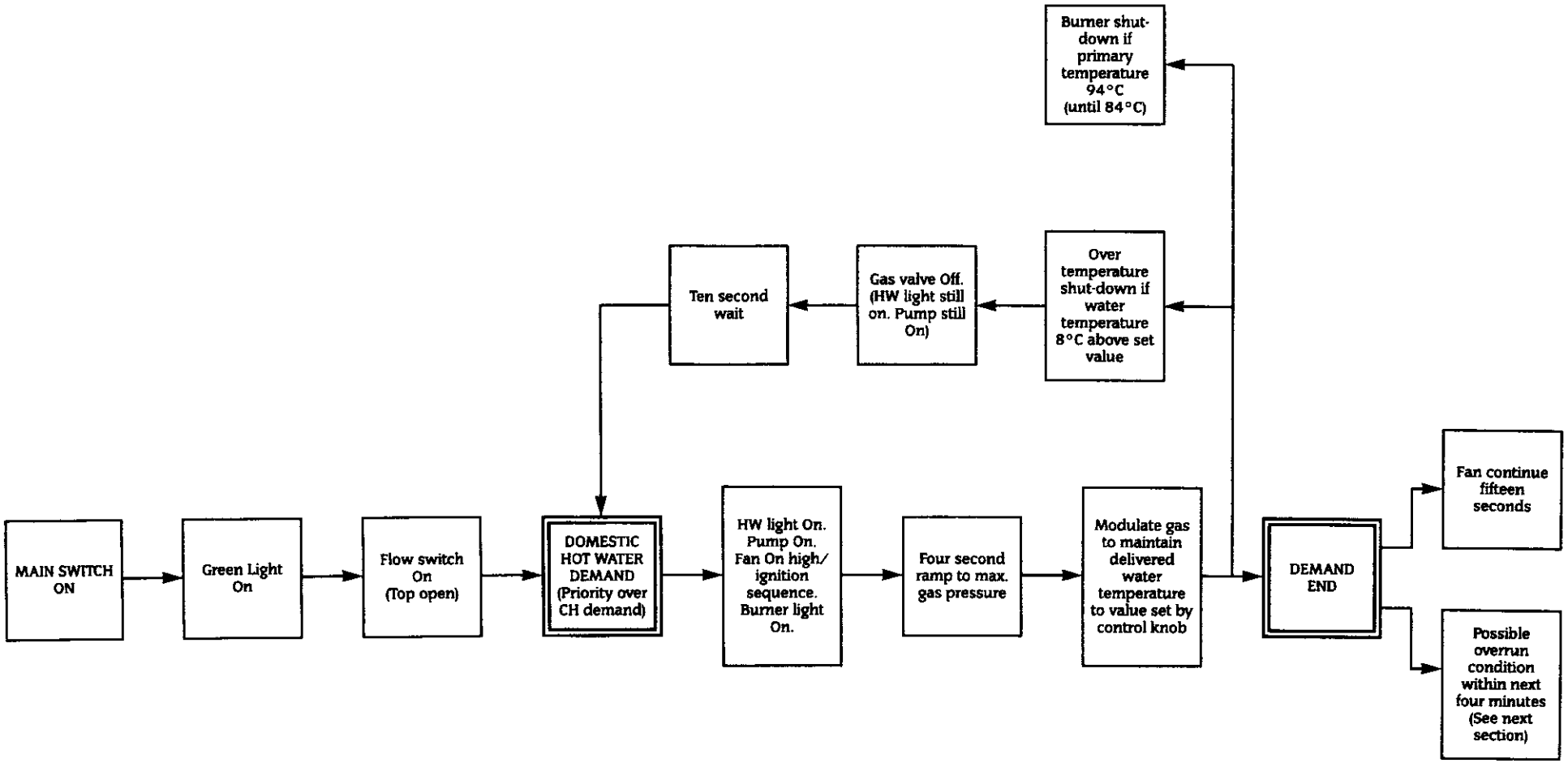
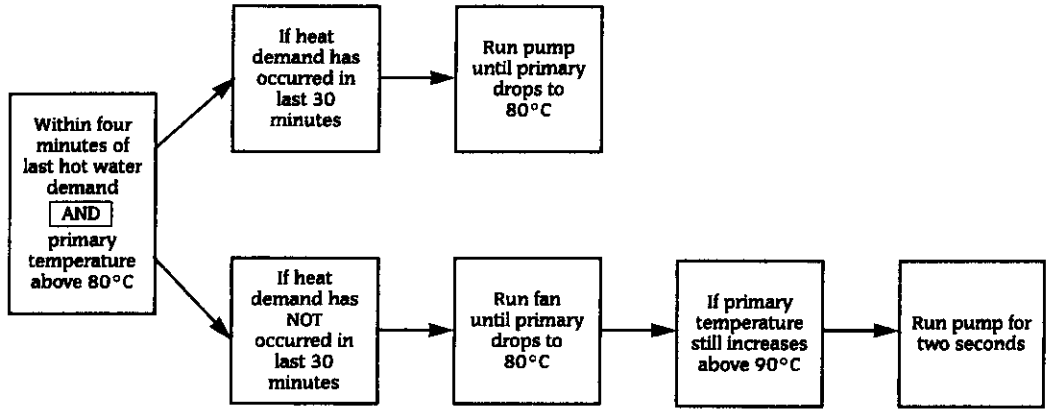
CENTRAL HEATING FUNCTION


MAIN SWITCH ON
Green Light On
Room thermostat and/or mains programmer (or link) On
AND
Electronic facia programmer (if fitted) On
AND
ST13 link in
AND
CH control knob On
CENTRAL HEATING DEMAND
CH light On. Pump On. Fan On low/ ignition sequence. Burner light On.
Two minute minimum burner pressure then ramp up pressure over next one minute
Modulate gas to maintain flow temperature set by control knob
DEMAND END
Pump continue four minutes. Fan continue fifteen seconds
Three minute wait
Gas valve Off. (CH light still on. Pump still On)
Over temperature shut-down if flow temperature 5°C above set value

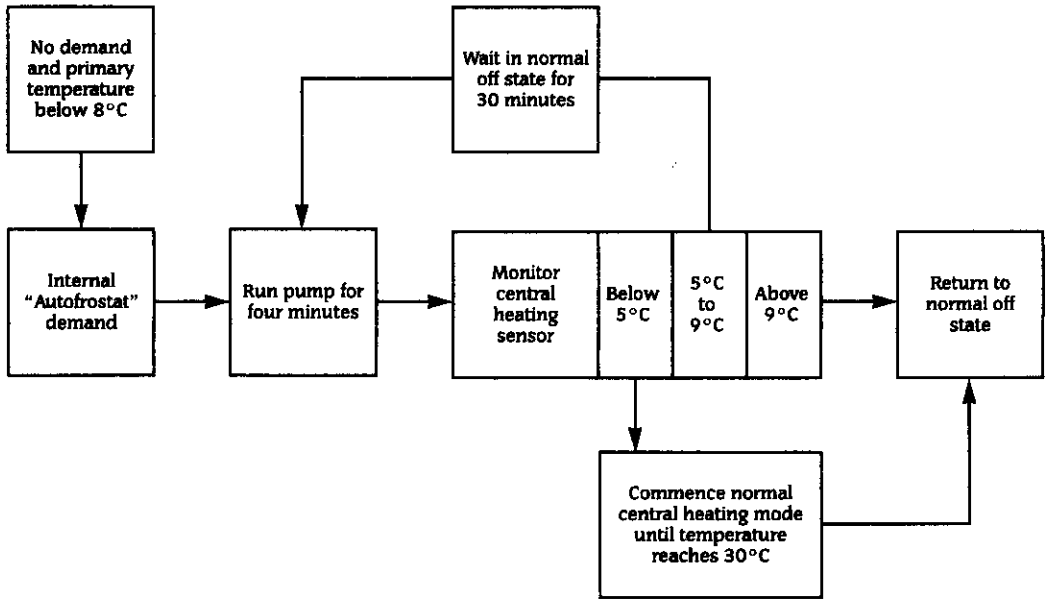
DOMESTIC HOT WATER FUNCTION


Burner shut-down if primary temperature 94°C (until 84°C)
Over temperature shut-down if water temperature 8°C above set value
Gas valve Off. (HW light still on. Pump still On)
Ten second wait
MAIN SWITCH ON
Green Light On
Flow switch On (Top open)
DOMESTIC HOT WATER DEMAND (Priority over CH demand)
HW light On. Pump On. Fan On high/ ignition sequence. Burner light On.
Four second ramp to max. gas pressure
Modulate gas to maintain delivered water temperature to value set by control knob
DEMAND END
Fan continue fifteen seconds
Possible overrun condition within next four minutes (See next section)

OVERRUN FUNCTION


Within four minutes of last hot water demand
AND
primary temperature above 80°C
If heat demand has occurred in last 30 minutes
Run pump until primary drops to 80°C
If heat demand has NOT occurred in last 30 minutes
Run fan until primary drops to 80°C
If primary temperature still increases above 90°C
Run pump for two seconds

AUTOFROSTAT FUNCTION


No demand and primary temperature below 8°C
Wait in normal off state for 30 minutes
Internal "Autofrostat" demand
Run pump for four minutes
Monitor central heating sensor
Below 5°C
5°C to 9°C
Above 9°C
Return to normal off state
Commence normal central heating mode until temperature reaches 30°C

18. Fault Finding

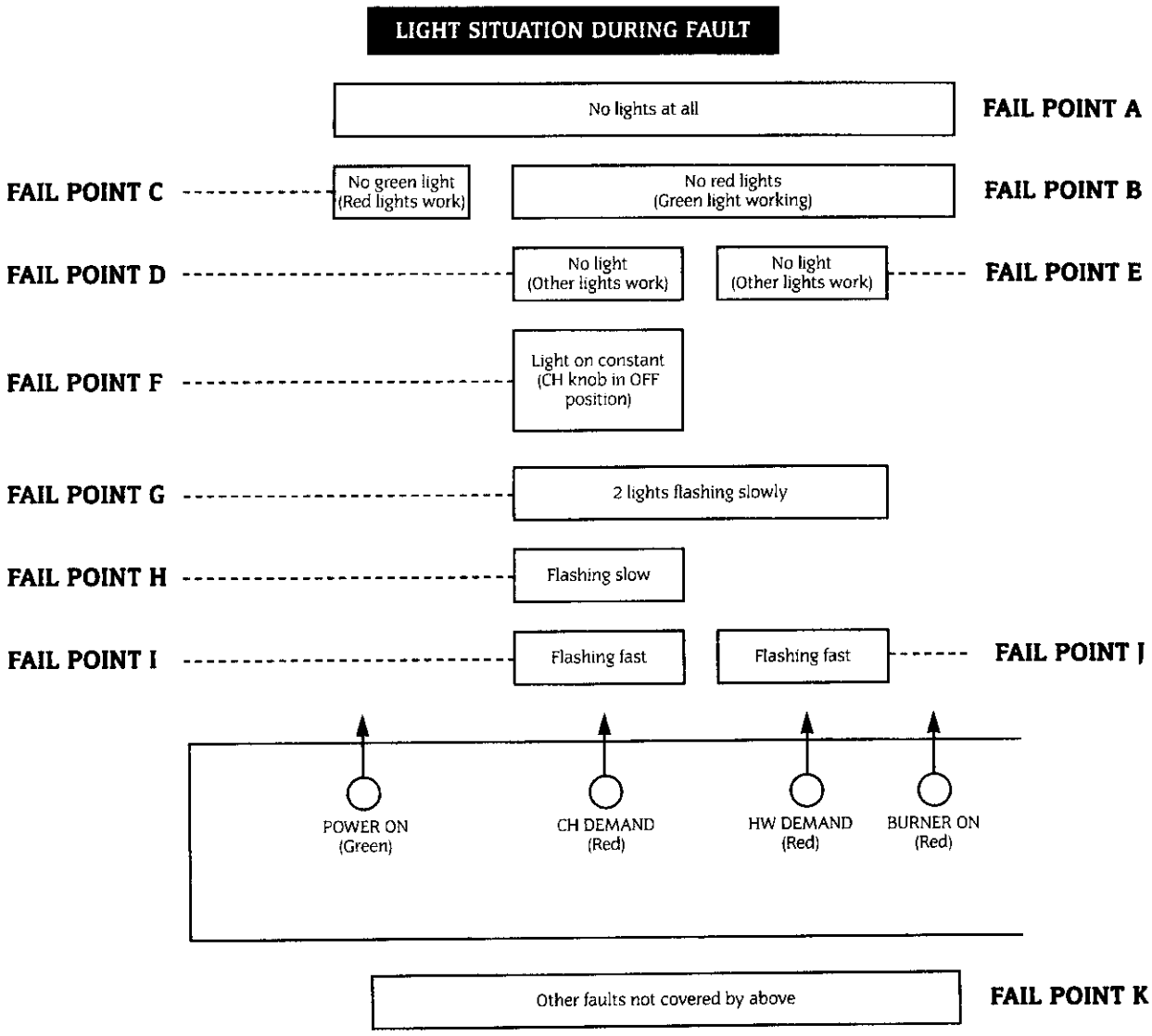
Note: This fault-finding information is for guidance only. Worcester Heat Systems cannot be held responsible for costs incurred by persons not deemed to be competent.

The electronic control system for this boiler incorporates four lights on the facia. These are used to show normal operating status. But as a secondary function, by flashing, they can also be used to help provide fault diagnostics. Therefore, with individual or groups of lights being permanently off, on or flashing, every normal fault can be identified.

To use the fault finding system, select a box below which represents the light situation during your fault. Then refer to the appropriate following section. This fault-finding system assumes that the appliance has been operating correctly until the time of failure.

PRELIMINARY CHECKS

Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check (a) EARTH CONTINUITY, (b) SHORT CIRCUIT CHECK, (c) POLARITY and (d) RESISTANCE TO EARTH.

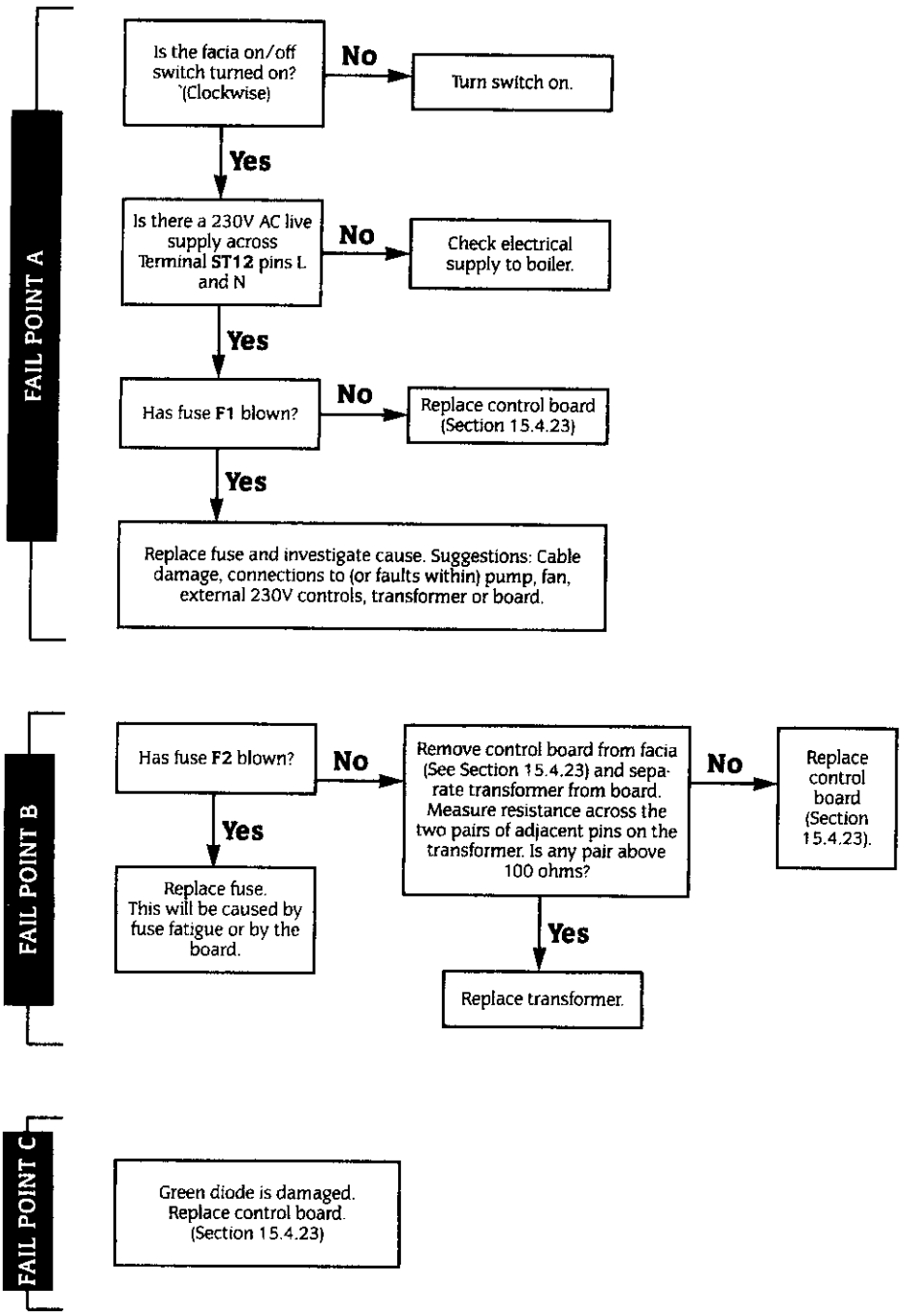


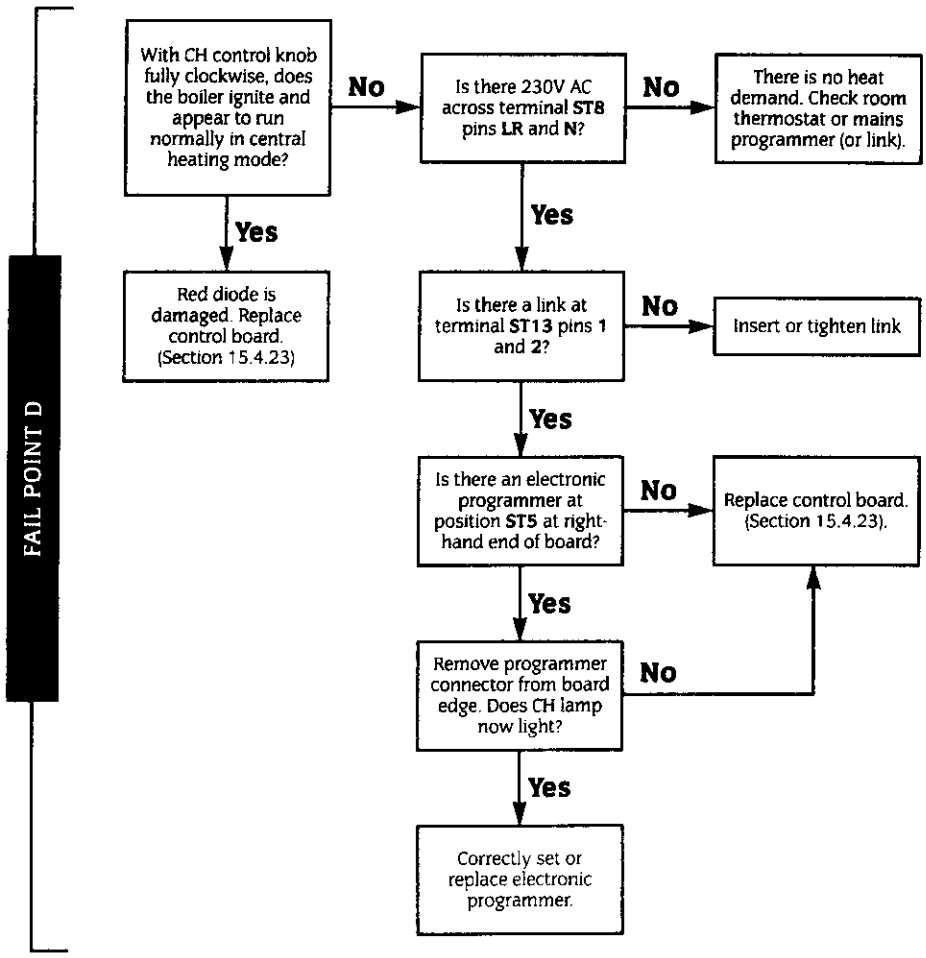
Note:

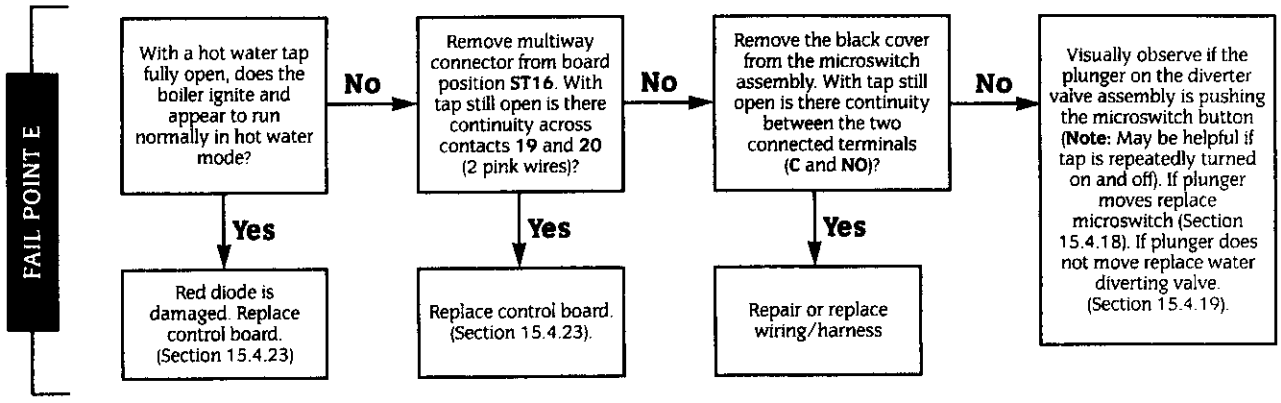
Slow flash is once per second, fast flash is five times per second.

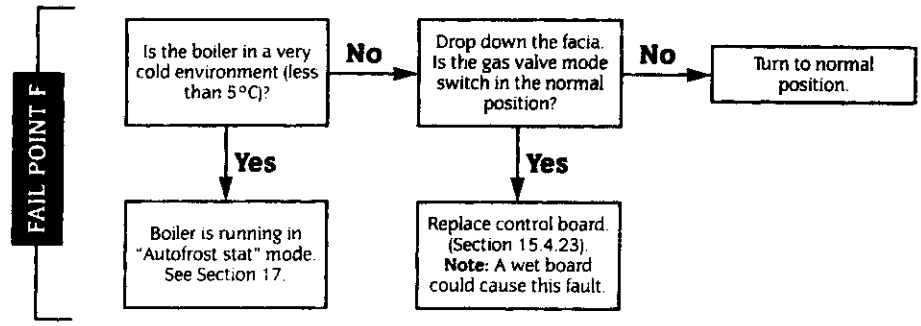
Slow flash can only be cleared by using the facia reset button (press for at least one second).

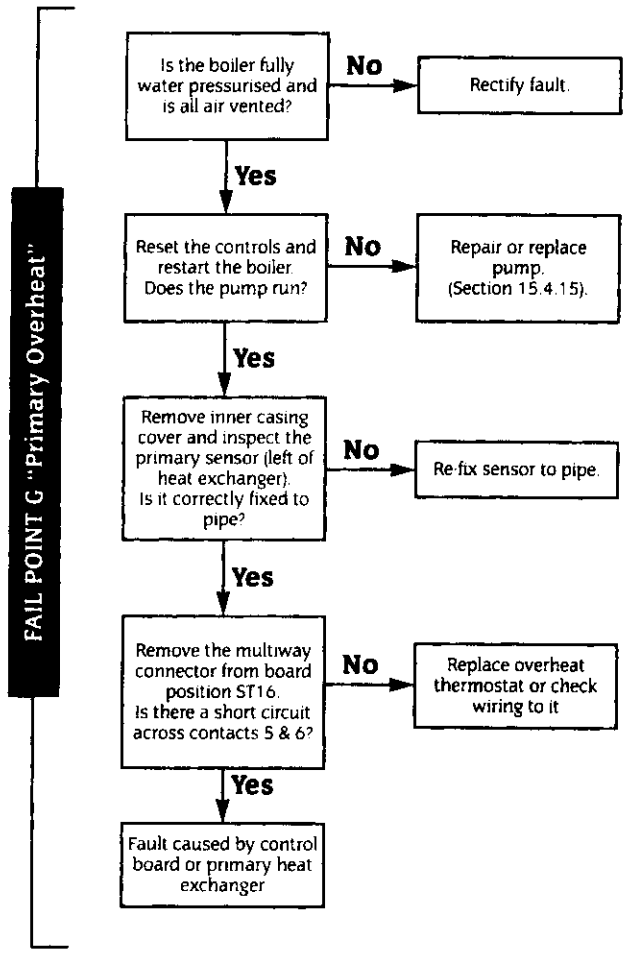
Fast flash is cleared by removing fault and/or main switch off/on.

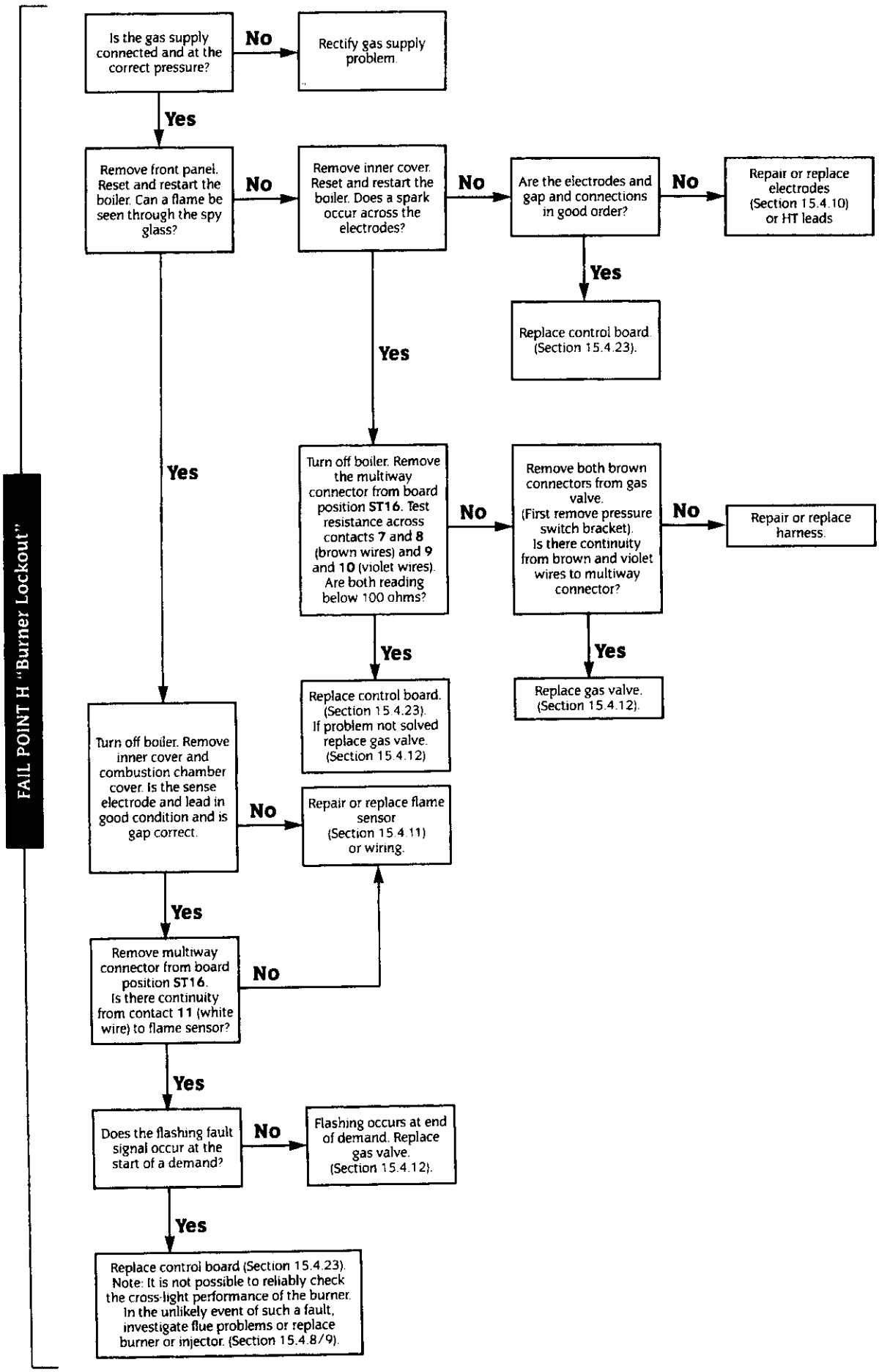

FAIL POINT A
Is the facia on/off switch turned on? (Clockwise)
No
Turn switch on.
Yes
Is there a 230V AC live supply across Terminal ST12 pins L and N
No
Check electrical supply to boiler.
Yes
Has fuse F1 blown?
No
Replace control board (Section 15.4.23)
Yes
Replace fuse and investigate cause. Suggestions: Cable damage, connections to (or faults within) pump, fan, external 230V controls, transformer or board.
FAIL POINT B
Has fuse F2 blown?
No
Remove control board from facia (See Section 15.4.23) and separate transformer from board. Measure resistance across the two pairs of adjacent pins on the transformer. Is any pair above 100 ohms?
No
Replace control board (Section 15.4.23).
Yes
Replace fuse. This will be caused by fuse fatigue or by the board.
Yes
Replace transformer.
FAIL POINT C
Green diode is damaged. Replace control board. (Section 15.4.23)

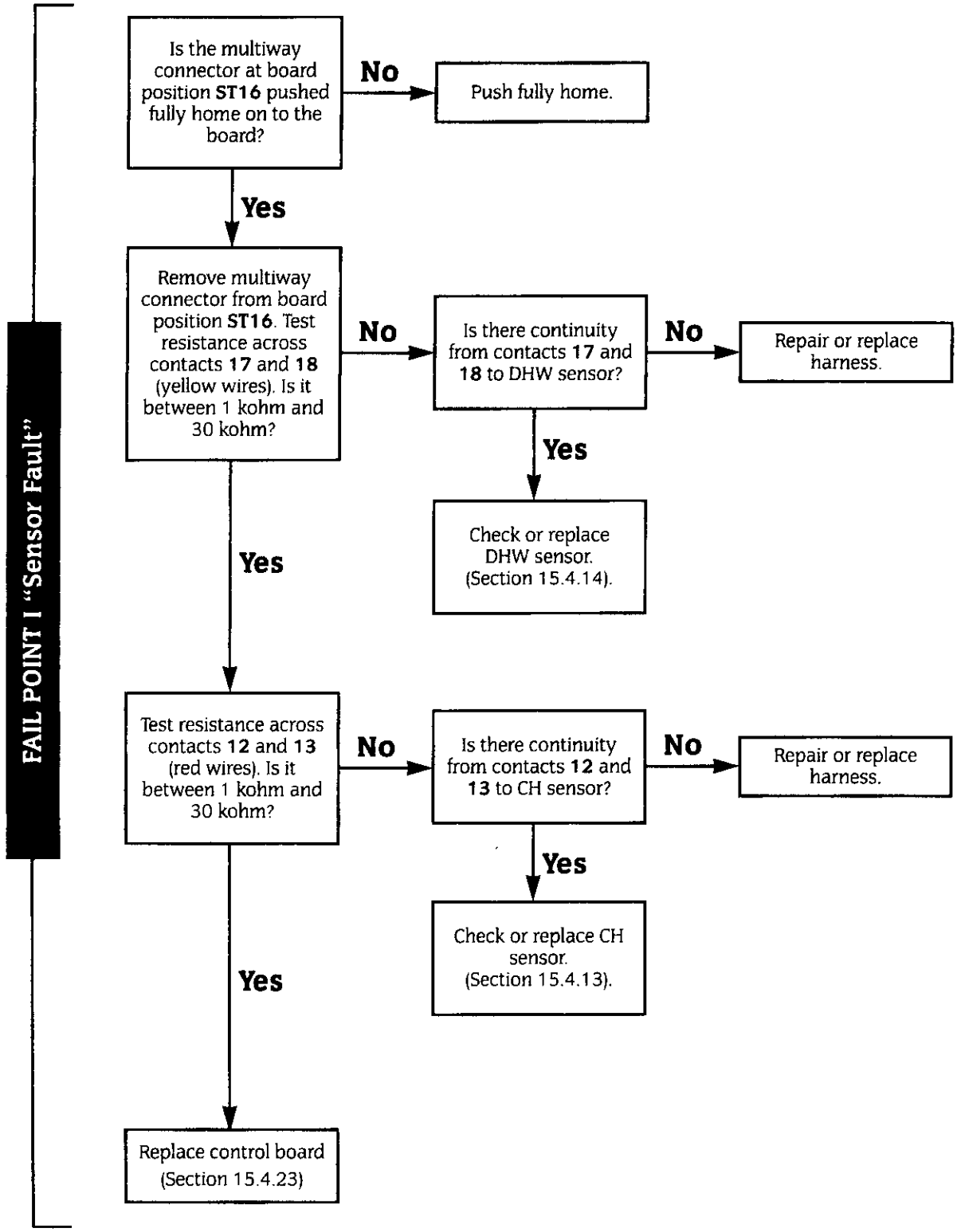

FAIL POINT D
With CH control knob fully clockwise, does the boiler ignite and appear to run normally in central heating mode?
No
Is there 230V AC across terminal ST8 pins LR and N?
No
There is no heat demand. Check room thermostat or mains programmer (or link).
Yes
Yes
Red diode is damaged. Replace control board. (Section 15.4.23)
Is there a link at terminal ST13 pins 1 and 2?
No
Insert or tighten link
Yes
Is there an electronic programmer at position ST5 at right-hand end of board?
No
Replace control board. (Section 15.4.23).
Yes
Remove programmer connector from board edge. Does CH lamp now light?
No
Yes
Correctly set or replace electronic programmer.

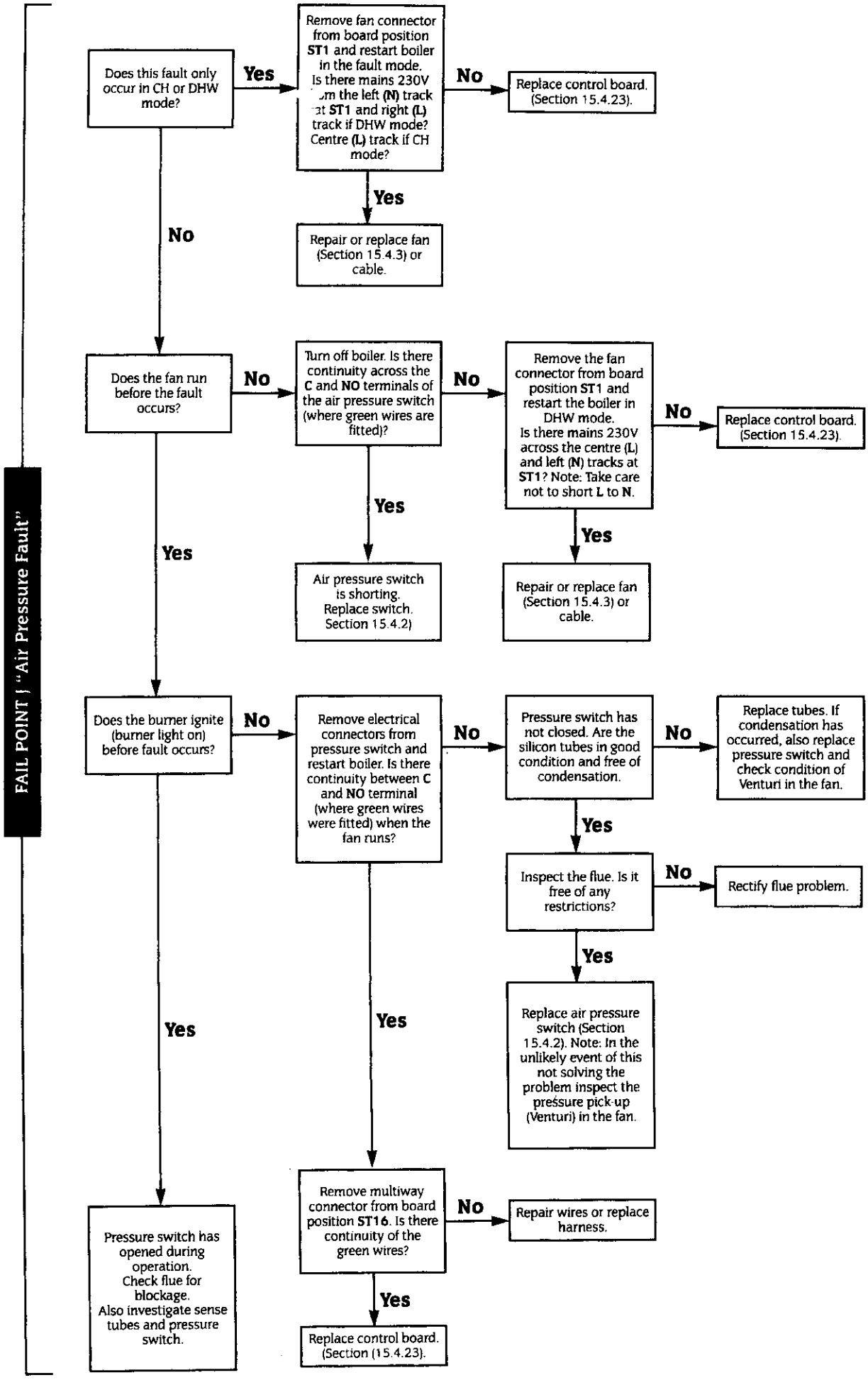

FAIL POINT E
With a hot water tap fully open, does the boiler ignite and appear to run normally in hot water mode?
No
Remove multiway connector from board position ST16. With tap still open is there continuity across contacts 19 and 20 (2 pink wires)?
No
Remove the black cover from the microswitch assembly. With tap still open is there continuity between the two connected terminals (C and NO)?
No
Visually observe if the plunger on the diverter valve assembly is pushing the microswitch button (Note: May be helpful if tap is repeatedly turned on and off). If plunger moves replace microswitch (Section 15.4.18). If plunger does not move replace water diverting valve. (Section 15.4.19).
Yes
Yes
Yes
Red diode is damaged. Replace control board. (Section 15.4.23)
Replace control board. (Section 15.4.23).
Repair or replace wiring/harness

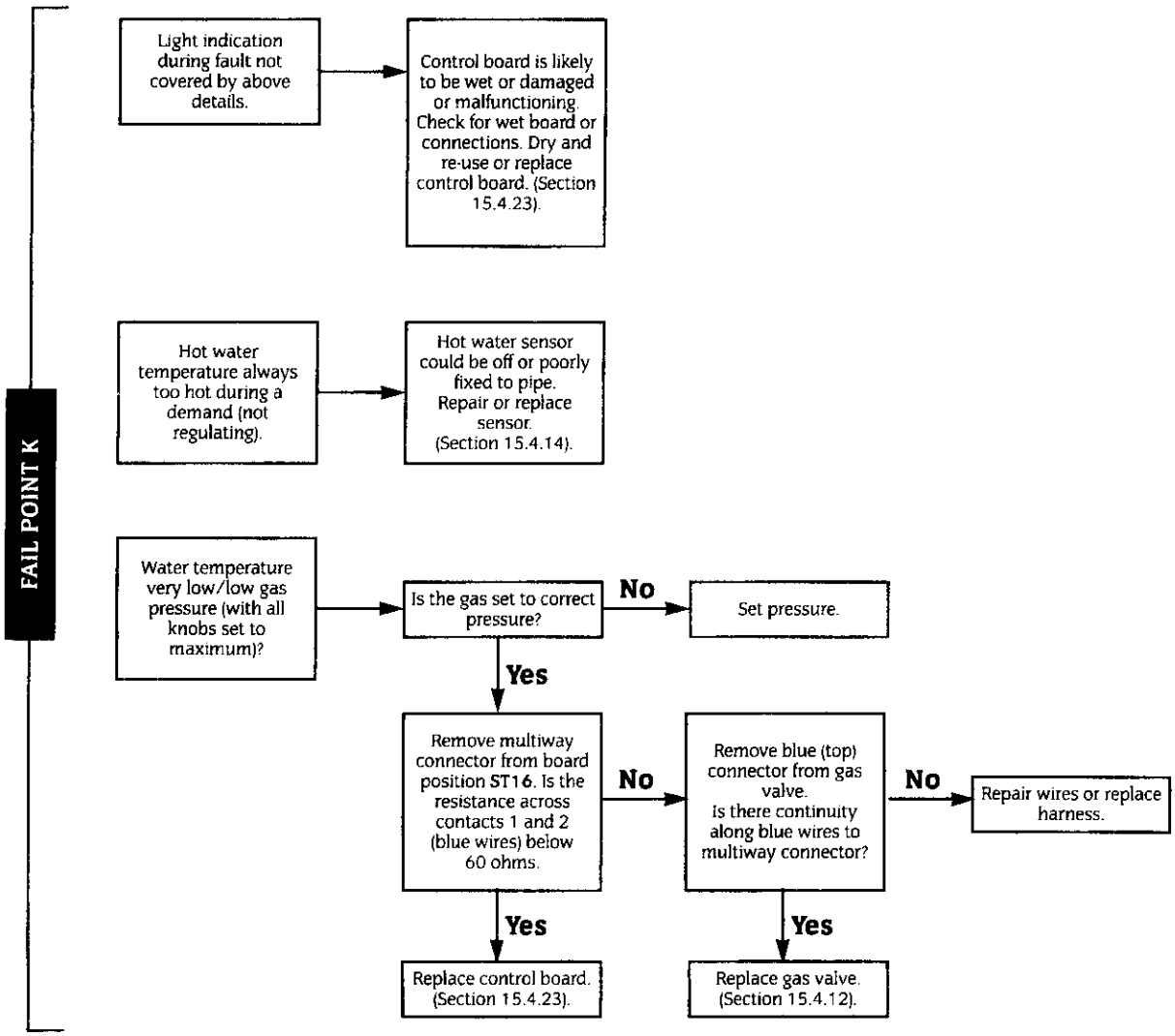

FAIL POINT F
Is the boiler in a very cold environment (less than 5°C)?
No
Drop down the facia. Is the gas valve mode switch in the normal position?
No
Turn to normal position.
Yes
Yes
Boiler is running in "Autofrost stat" mode. See Section 17.
Replace control board. (Section 15.4.23). Note: A wet board could cause this fault.


FAIL POINT G "Primary Overheat"
Is the boiler fully water pressurised and is all air vented?
No
Rectify fault.
Yes
Reset the controls and restart the boiler. Does the pump run?
No
Repair or replace pump. (Section 15.4.15).
Yes
Remove inner casing cover and inspect the primary sensor (left of heat exchanger). Is it correctly fixed to pipe?
No
Re-fix sensor to pipe.
Yes
Remove the multiway connector from board position ST16. Is there a short circuit across contacts 5 & 6?
No
Replace overheat thermostat or check wiring to it
Yes
Fault caused by control board or primary heat exchanger


FAIL POINT H "Burner Lockout"
Is the gas supply connected and at the correct pressure?
No
Rectify gas supply problem.
Yes
Remove front panel. Reset and restart the boiler. Can a flame be seen through the spy glass?
No
Remove inner cover. Reset and restart the boiler. Does a spark occur across the electrodes?
No
Are the electrodes and gap and connections in good order?
No
Repair or replace electrodes (Section 15.4.10) or HT leads
Yes
Replace control board. (Section 15.4.23).
Yes
Yes
Turn off boiler. Remove the multiway connector from board position ST16. Test resistance across contacts 7 and 8 (brown wires) and 9 and 10 (violet wires). Are both reading below 100 ohms?
No
Remove both brown connectors from gas valve. (First remove pressure switch bracket). Is there continuity from brown and violet wires to multiway connector?
No
Repair or replace harness.
Yes
Replace control board. (Section 15.4.23). If problem not solved replace gas valve. (Section 15.4.12)
Yes
Replace gas valve. (Section 15.4.12).
Turn off boiler. Remove inner cover and combustion chamber cover. Is the sense electrode and lead in good condition and is gap correct.
No
Repair or replace flame sensor (Section 15.4.11) or wiring.
Yes
Remove multiway connector from board position ST16. Is there continuity from contact 11 (white wire) to flame sensor?
No
Yes
Does the flashing fault signal occur at the start of a demand?
No
Flashing occurs at end of demand. Replace gas valve. (Section 15.4.12).
Yes
Replace control board (Section 15.4.23). Note: It is not possible to reliably check the cross-light performance of the burner. In the unlikely event of such a fault, investigate flue problems or replace burner or injector. (Section 15.4.8/9).


FAIL POINT 1 "Sensor Fault"
Is the multiway connector at board position ST16 pushed fully home on to the board?
No
Push fully home.
Yes
Remove multiway connector from board position ST16. Test resistance across contacts 17 and 18 (yellow wires). Is it between 1 kohm and 30 kohm?
No
Is there continuity from contacts 17 and 18 to DHW sensor?
No
Repair or replace harness.
Yes
Check or replace DHW sensor. (Section 15.4.14).
Yes
Test resistance across contacts 12 and 13 (red wires). Is it between 1 kohm and 30 kohm?
No
Is there continuity from contacts 12 and 13 to CH sensor?
No
Repair or replace harness.
Yes
Check or replace CH sensor. (Section 15.4.13).
Yes
Replace control board (Section 15.4.23)


FAIL POINT | "Air Pressure Fault"
Does this fault only occur in CH or DHW mode?
Yes
Remove fan connector from board position ST1 and restart boiler in the fault mode. Is there mains 230V across the left (N) track at ST1 and right (L) track if DHW mode? Centre (L) track if CH mode?
No
Replace control board. (Section 15.4.23).
Yes
Repair or replace fan (Section 15.4.3) or cable.
No
Does the fan run before the fault occurs?
No
Turn off boiler. Is there continuity across the C and NO terminals of the air pressure switch (where green wires are fitted)?
No
Remove the fan connector from board position ST1 and restart the boiler in DHW mode. Is there mains 230V across the centre (L) and left (N) tracks at ST1? Note: Take care not to short L to N.
No
Replace control board. (Section 15.4.23).
Yes
Air pressure switch is shorting. Replace switch. Section 15.4.2)
Yes
Repair or replace fan (Section 15.4.3) or cable.
Yes
Does the burner ignite (burner light on) before fault occurs?
No
Remove electrical connectors from pressure switch and restart boiler. Is there continuity between C and NO terminal (where green wires were fitted) when the fan runs?
No
Pressure switch has not closed. Are the silicon tubes in good condition and free of condensation.
No
Replace tubes. If condensation has occurred, also replace pressure switch and check condition of Venturi in the fan.
Yes
Inspect the flue. Is it free of any restrictions?
No
Rectify flue problem.
Yes
Replace air pressure switch (Section 15.4.2). Note: In the unlikely event of this not solving the problem inspect the pressure pick-up (Venturi) in the fan.
Yes
Yes
Pressure switch has opened during operation. Check flue for blockage. Also investigate sense tubes and pressure switch.
Remove multiway connector from board position ST16. Is there continuity of the green wires?
No
Repair wires or replace harness.
Yes
Replace control board. (Section (15.4.23).


FAIL POINT K
Light indication during fault not covered by above details.
Control board is likely to be wet or damaged or malfunctioning. Check for wet board or connections. Dry and re-use or replace control board. (Section 15.4.23).
Hot water temperature always too hot during a demand (not regulating).
Hot water sensor could be off or poorly fixed to pipe. Repair or replace sensor. (Section 15.4.14).
Water temperature very low/low gas pressure (with all knobs set to maximum)?
Is the gas set to correct pressure?
No
Set pressure.
Yes
Remove multiway connector from board position ST16. Is the resistance across contacts 1 and 2 (blue wires) below 60 ohms.
No
Remove blue (top) connector from gas valve. Is there continuity along blue wires to multiway connector?
No
Repair wires or replace harness.
Yes
Yes
Replace control board. (Section 15.4.23).
Replace gas valve. (Section 15.4.12).

This manual is to be used in conjunction with the variant part number of the bar code below:

WORCESTER

Bosch Group

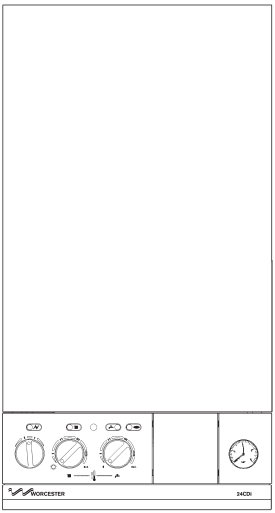
Worcester Heat Systems Limited, Cotswold Way, Warndon, Worcester WR4 9SW.
Telephone (01905) 754624. Fax: (01905) 754619.
Technical Helpline (0990) 266241.

This booklet is accurate at the date of printing but will be superseded and should be disregarded if specifications and/or appearances are changed in the interests of continued improvement.
All goods sold are subject to our official Conditions of Sale, a copy of which may be obtained on application.

PUBLICATION 8 716 145 020d 05/00

WORCESTER

Bosch Group



24CDi, 28CDi & 35CDi II COMBI

benchmark™

Worcester Bosch supports the Benchmark code of practice

APPLIANCE	G.C. NUMBERS NATURAL GAS	L.P.G.
24CDi Fanned Flued (RSF)	47 311 30	47 311 31
24CDi Balanced Flued (BF)	47 311 29	
24CDi Open Flued (OF)	47 311 32	47 311 33
28CDi Fanned Flue (RSF)	47 311 34	47 311 35
35CDi II Fanned Flue (RSF)	47 311 58	47 311 59

USER INSTRUCTIONS & CUSTOMER CARE GUIDE

EXCELLENCE COMES AS STANDARD

Thank you for purchasing a Worcester CDi gas-fired combination appliance.

Worcester CDi appliances are made by Worcester Heat Systems and the strictest quality control standards are demanded throughout every stage of production.

Indeed, Worcester Heat Systems have led the field in innovative appliance design and performance for more than 30 years.

The result is that your new Worcester CDi appliance offers you the very best of everything - quality, efficiency, economical running costs, proven reliability and value for money.

What's more, you also have the assurance of our no-nonsense 1 year parts and labour guarantee.

And, to keep your boiler operating at peak condition and efficiency, an optional maintenance scheme is available from Worcester Heat Systems Ltd. Contact our Service Contracts team on 01905 754624 for further details.

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GENERAL INFORMATION

GAS SAFETY (INSTALLATION AND USE) REGULATIONS 1998

It is the law that all gas appliances must be installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest and that of safety to ensure compliance with the law. The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

WARNING: This appliance must be earthed and protected by a 3 amp fuse.

ELECTRICITY SUPPLY: 230V ~ 50Hz

IMPORTANT: To get the best from your Worcester CDi please read these instructions carefully.

NOTE: In the event of a fault the appliance should not be used until the fault has been corrected by a competent person.

BENCHMARK benchmark

The Benchmark initiative is a code of practice to encourage the correct installation, commissioning and servicing of domestic central heating boilers and system equipment.

A 'log book' is dispatched with every appliance, **This is a vital document that needs to be completed by the installer at the time of installation. It confirms that the boiler has been installed and commissioned according to the manufacturers instructions.**

All CORGI Registered Installers carry a CORGI ID card and have a registration number. Both should be recorded in your central heating log book. You can check that your installer is CORGI registered by calling CORGI on 01256 372300.

Without the completion of the log book, manufacturers may refuse to respond to a call-out request. It is important that your installer has given you the fully completed log book.

GENERAL DESCRIPTION

(See Fig.1.)

The WORCESTER CDi MODELS are combined domestic hot water and central heating appliances. They consist of a gas fired boiler having a varying output of between:

	CH	DHW
24CDi	9.0 - 24kW	9.0 - 24kW
28CDi	9.0 - 24kW	9.0 - 28kW
35CDi II	10.5 - 27.5kW	9.5 - 35.3kW

a heat exchanger to provide domestic hot water via the boiler, circulating pump and water diverting valve. All the necessary controls to provide mains fed domestic hot water and central heating.

The appliances are supplied as standard with a manual operating switch. Alternatively a facia mounted programmer may have been fitted.

The appliances can operate in one of two modes. Hot water only or hot water and central heating.

Hot Water Mode:

When a demand is made for hot water by opening a tap or shower; the flow switch will energise the pump and circulate primary hot water around the boiler and water to water heat exchanger. The burner will light to its maximum setting.

When hot water is no longer required the appliance pump (or fan) may continue to operate to dissipate the residual heat within the boiler.

A flow restrictor is fitted within the appliance which limits a hot water delivery rate to a maximum of:

24CDi	9.0 (±15%) litres/minute
28CDi	10.0 (±15%) litres/minute
35CDi **II**	12.0 (±15%) litres/minute

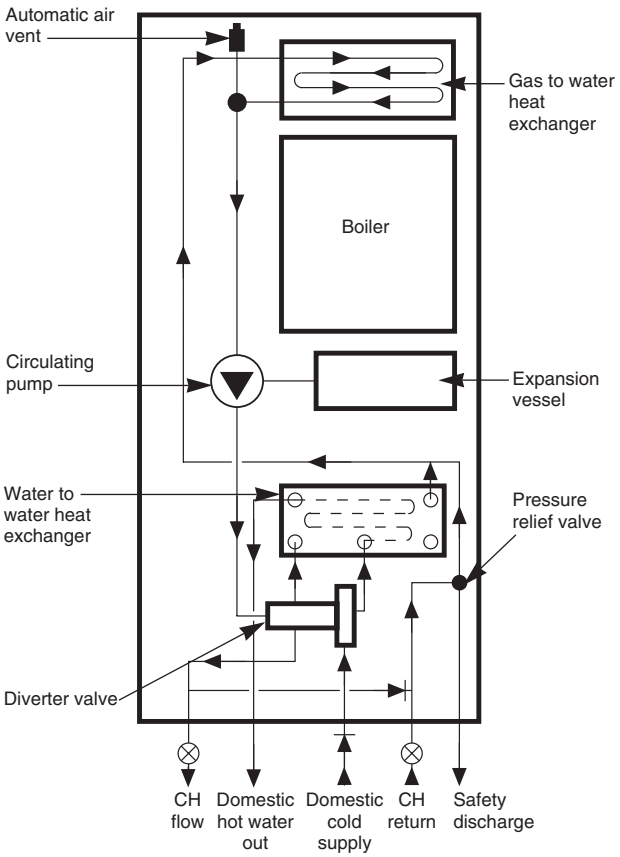
Hot Water and Central Heating mode:

When a demand is made for heating by the system controls (i.e. a programmer or room thermostat), the pump will energise, circulating primary water around the heating system and the burner will light. The heat output from the appliance in this mode has been factory set to maximum. The appliance will operate as necessary to maintain the temperature of the radiators at the level set by the adjustment of the Heating Temperature Control Knob. (See Fig. 2.)

If the system no longer requires output to maintain the desired room temperature, the burner will extinguish. The pump will continue to run for a short period to dissipate the residual heat from the appliance and then switch off.

The appliance will supply heat to the central heating system as required. A demand for hot water at a tap or shower will override the central heating function for the period of the domestic hot water demand.

Fig. 1. System Diagram.

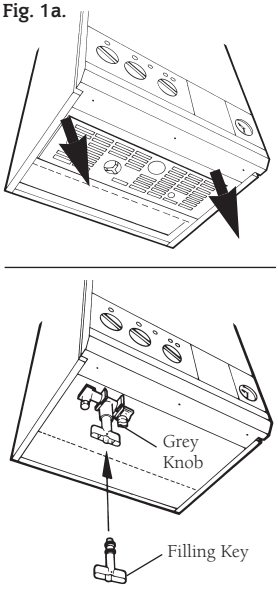


GENERAL NOTES

CENTRAL HEATING SYSTEM

During the first few hours of operation of the central heating system, check that all radiators are being heated at an even rate. Should the upper area of a radiator be at a lower temperature than the base of the radiator, it should be vented by releasing air through the venting screw at the top of each radiator. Make sure your installer shows you how to carry out the operation. Repeated venting will reduce the quantity of water in the system and this must be replenished for safe and satisfactory operation of the appliance. Should water leaks be found in the system or excessive venting be required from any radiator, your installer or heating engineer should be contacted and the system corrected.

Fig. 1a.



SEALED HEATING SYSTEM

The appliance can be fitted to a sealed heating system which is pre-pressurised. In this case your installer will advise you on the minimum and maximum pressure that should be indicated on the pressure gauge. See Fig. 2. Check regularly that this pressure is maintained and contact your installer or maintenance engineer if there is a permanent significant drop in pressure indicated on the gauge. If the system loses pressure it should be re-pressurised as instructed by the installer **(N.B. Maximum operating pressure 2.5 bar)**.

Re-pressurising The System (See Fig. 1a).
(If in doubt leave this procedure to your installer).

Remove the bottom panel to gain access to the filling loop assembly.

Insert the bayonet end of the filling key into the corresponding cut outs in the filling loop housing and twist to lock the key in place.

Turn the grey knob anti-clockwise to allow water ingress and fill until the required pressure is reached.

Turn the grey knob clockwise to stop filling and remove the filling key by lining up the bayonet end of the key with the cut outs in the filling loop housing and withdrawing the key.

N.B. The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with Bylaw 14 of the Water Bylaws Scheme.

Store the key in a safe place for future use and refit the bottom panel.

OPEN VENTED HEATING SYSTEM

The appliance may be fitted to an open vented heating system your installer will advise you. There is no need to observe the pressure gauge.

CLEARANCES

	24,28CDi RSF	35CDi II	24CDi OF	24CDiBF
Left-hand side	10	10	10	10
Right-hand side	10	10	10	10
In Front	600	600	600	600
Above	180	180	300	100
Below	200	200	200	200

Minimum clearances in millimetres.

Your installer will have provided adequate space around the appliance for safety and servicing. Do not restrict this space by the addition of cupboards, shelves etc. close to the appliance.

ROOM THERMOSTAT

A room thermostat may be fitted for control of the central heating temperature. It will be located in one room of the home. The method of setting a room thermostat varies with the type and manufacture. Refer to the instructions supplied with the room thermostat.

THERMOSTATIC RADIATOR VALVES

If thermostatic radiator valves are fitted to the system then they must conform to the requirements of BS2767:10. It is advisable to leave one valve permanently set at maximum to prevent the boiler short cycling.

SHOWERS, BIDETS, TAPS AND MIXING VALVES

Standard hot and cold taps and mixing valves used with the appliance must be suitable for operating at mains pressure. Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

If using a pressure equalising valve, set the Domestic Hot Water temperature control knob to the 'MAX' position.

Hot and cold mains fed water can be supplied direct to an overrim flushing bidet subject to local water company requirements.

With all mains fed systems the flow of water from the individual taps will vary with the number of outlets operated simultaneously and the cold water mains supply pressure to the property. Flow balancing using 'Ball-o-Fix' type valves is recommended to avoid an excessive reduction in flow to individual outlets.

For further information contact Worcester Heat Systems Technical Helpline. 08705 266241

HOT AND COLD FLOW

The flow of water demanded from both hot and cold service outlets is dependent upon mains supply, it may not be possible in some installations to operate all outlets simultaneously.

WATER MAINS FAILURE

It is important to note that in the event of a mains water supply failure, no tap water will be available until the mains supply is restored. The appliance can still be used for heating provided that the system is of the sealed system type. Open vent central heating systems should be turned off until the supply is restored.

USE IN HARD WATER AREAS

Normally there is no need for scale protection. However, in areas of exceptionally hard water supply it is recommended that an In-Line scale inhibitor be fitted.

Installation should be strictly in accordance with the requirements of the local Water Company. An isolating valve to facilitate servicing should be incorporated.

The water hardness may be determined using the standard test paper or by reference to the local Water Company.

Further information may be obtained from Worcester Heat Systems Technical Helpline.

AIR SUPPLY FOR OPEN FLUED (O.F.) APPLIANCES

Your installer will have made arrangements for an adequate supply of fresh air to the appliance. Fresh air is required for combustion. Do not block up any air ways which may be let into a wall or door. Do not hang clothes or other combustible materials over the appliance or against the flue pipe.

NOTE: Do not place anything on top of the appliance. If the appliance is fitted in a compartment do not use the compartment for storage purposes unless it conforms to the requirements of BS 6798:1987: Section 6. In particular, the flue pipe should not pass through an airing cupboard space unless protected by a guard (such as wire mesh) concentrically spaced 13mm (½in), as described in BS 6798:1987.

VENTILATION OF BALANCED FLUED (BF) AND ROOM SEALED FANNED FLUE (RSF) APPLIANCES

These are room sealed appliances and any ventilation openings in a wall or door must not be obstructed. Do not allow the flue terminal fitted on the outside wall to become obstructed or damaged.

NOTE: Do not place anything on top of the appliance. If the appliance is fitted in a compartment do not use the compartment for storage purposes unless it conforms to the requirements of BS 6798:1987: Section 6. It is essential that the airing space is separated from the boiler space by a perforated non-combustible partition as described in BS 6798:1987.

CIRCULATING PUMP

This may be fitted with a speed adjuster. If so it will be factory set at maximum and should not be changed.

FROST PRECAUTIONS

If the appliance is not to be used for a long period of time and there is a likelihood of freezing, then the appliance should be drained. The Worcester Heat Systems Technical Helpline will advise you on suitable frost precautions. For short periods, the built-in frost protection of the appliance will be adequate.

SERVICE

Annual servicing is important to ensure continuing high efficiency and long life of your appliance. Suitable servicing arrangements should be made with a competent third party. In the event of any difficulty in making suitable service arrangements, Worcester Heat Systems Ltd. will be happy to discuss regular servicing and offer a comprehensive maintenance contract.

IMPORTANT: Do not touch or adjust any sealed compontent.

WARNING

If a gas leak exists, or is suspected, turn off the gas supply to the appliance at the service cock and consult your local service engineer.

Do not touch any electrical switches to turn them either on or off. Open all windows and doors. Do not smoke. Extinguish all naked lights.

CLEANING

Do not use abrasive cleaners on the outer casing. Use a damp cloth and a little detergent.

OPERATION OF CONTROLS

OPERATING SWITCH

In the ' ☼ ' position there is no mains electricity to the appliance.

In the **'I'** position mains electricity is connected to the appliance.

CENTRAL HEATING TEMPERATURE CONTROL

The position of this knob will determine the temperature of the water delivered to the radiators between the **'I'** and **'MAX'** position. When the knob is turned anti-clockwise past the **'I'** position towards the ' ☼ ' (Summer Position), then the appliance will operate in the HOT WATER mode only and no heat will be delivered to the radiators.

DOMESTIC HOT WATER TEMPERATURE CONTROL

The position of this knob will determine the temperature of the water delivered at the domestic hot water taps between the ' ☼ ' and the **'MAX'** position.

By slightly reducing the flow of domestic water from the tap, the delivery temperature of the water will be further increased. This is of particular advantage in the winter, for example to increase bath water temperature. Also this will provide an added advantage of reducing the delay before hot water is obtained.

FACIA MOUNTED PROGRAMMER (if fitted)

Your installer may have mounted either a mechanical or an electronic programmer into the facia of your appliance. Operating instructions are supplied with the programmer.

RESET BUTTON

Press this button in for five seconds if any of the indicator lights are flashing slowly.

SYSTEM PRESSURE GAUGE

The red needle has been set to show the sealed system pressure which is required for the appliance to operate effectively. The grey needle will show the actual pressure in the system. This does not apply to any open vent system.

INDICATOR LIGHTS

Mains electricity indicator:

OFF : No mains electricity to the appliance
ON : Mains electricity is connected to the appliance

Central heating demand indicator:

OFF : No demand for heat to the central heating circuit
ON : Central heating demand
FLASHING SLOW (once per second) : Ignition lockout
FLASHING FAST (five times per second) : Appliance fault (other than ignition lockout)

Domestic hot water demand indicator:

OFF : No demand for domestic hot water
ON : Domestic hot water demand
FLASHING FAST (five times per second) : Air flow fault (RSF). Flue gas spillage (OF)

Central heating and domestic hot water demand indicators:

BOTH FLASHING SLOW (once per second) : Overheat cut-off

Flame detection indicator:

OFF : Burner off
ON : Burner on

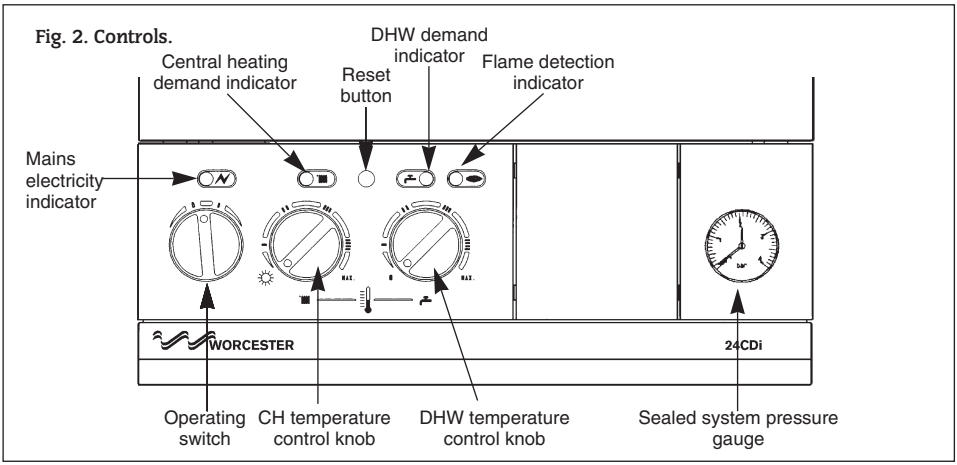


Fig. 2. Controls.

TO LIGHT AND STOP THE APPLIANCE

TO LIGHT THE APPLIANCE

Check that the water valves to the central heating circuit are open.

On sealed systems check that the grey needle on the pressure gauge is not below the required pressure.

Switch on the mains electricity. The green power on indicator will light. Set the room thermostat, if fitted, to maximum. Turn the central heating temperature control knob to **'MAX'.** The red central heating demand indicator will light.

The burner will light and the red flame detection indicator will light.

Set the central heating and hot water temperature control knobs and the room thermostat, if fitted, to the desired temperature.

TO STOP THE APPLIANCE

For Short Periods

Turn the central heating temperature control knob fully anti-clockwise to the ' ☼ ' position.

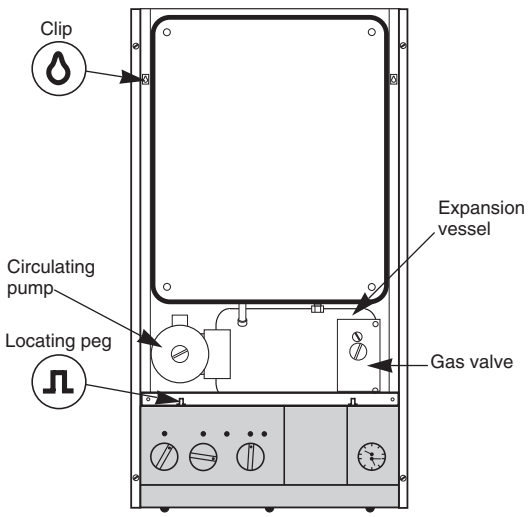
For Long Periods

Turn the operating switch to the ' ☼ ' position. Switch off the mains electricity.

A facia mounted electronic programmer will retain its settings for about two weeks, after which it will return to the factory set programme. The display will disappear after approximately 12 hours.

A facia mounted mechanical programmer will require resetting once the operating switch has been set to **'O'**, or the mains supply has been disconnected.

Fig. 3. CDi with front panel removed.



ELECTRICITY SUPPLY FAILURE

If the electricity supply fails the appliance will not operate. Once the supply is restored the appliance will return to normal operation. If a programmer is fitted, check that the settings have been maintained.

OVERHEAT CUT-OFF THERMOSTAT

The appliance will enter a lockout condition in the event of overheating.

An overheat cut-off thermostat is fitted to the appliance which will interrupt the electricity supply to the gas valve.

If the overheat cut-off has operated, both the central heating and the hot water demand indicators will flash together.